DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
INTEGRATED PRODUCT TEAM WEST
2001 JUNIPERO SERRA BOULEVARD, SUITE 600
DALY CITY, CALIFORNIA 94014-1976

IN REPLY REFER TO

Ser 05/485
April 14, 2005

Mr. Phillip A. Ramsey
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, CA 94105

Re: RESULTS OF LIQUEFACTION STUDY AND LANDFILL GAS STUDY, SITE 1, TIDAL AREA LANDFILL, NAVAL WEAPONS STATION SEAL BEACH, DETACHMENT CONCORD, CONCORD, CALIFORNIA

Dear Mr. Ramsey,

1. In response to comments received on our December 24, 2004 "Pre-Final (95%) Remedial Design, Landfill Cover, Tidal Area Landfill, Site 1, Naval Weapons Station Seal Beach, Detachment Concord" (pre-final design), the Navy had an evaluation performed of the potential for liquefaction at the subsurface at Site 1 during an earthquake. In a letter dated January 20, 2005 the Navy provided you with a copy of the work plan for this study. Today, we are pleased to provide the U.S. Environmental Protection Agency (U.S. EPA) with the results of this study in the enclosed report titled "Liquefaction Study, Site 1 Tidal Area Landfill, Naval Weapons Station Seal Beach, Detachment Concord." As planned, the results of this study will be incorporated into the draft final version of the "Closure Plan and Post-Closure Maintenance Plan," which will be submitted with the final design in compliance with State applicable or relevant and appropriate requirements (ARARs) specified in the Site 1 Record of Decision (ROD) for the landfill cover. A primary conclusion of the study is that the cover will not require any special design features to accommodate earthquake-induced movements.

2. The Navy is also pleased to present the U.S. EPA with the enclosed report titled "Landfill Gas Characterization, Site 1 Tidal Area Landfill, Naval Weapons Station Seal Beach, Detachment Concord." The landfill gas study was conducted as promised in the ROD to ensure that the design adequately considers any landfill gas generation. The results of this study indicate that there is no significant landfill gas generation.

3. As neither of the enclosed reports are Primary or Secondary documents under the Federal Facility Agreement (FFA), the Navy is providing them as informational and not seeking

comments. However, if you do have any concerns or questions regarding them, please do not hesitate to contact me at telephone No. 650-746-7451 or Internet e-mail: stephen.f.tyahla@navy.mil.

Sincerely,

Stephen F. Tyahla, P.E., CHMM
Lead Remedial Project Manager

Enclosures
Copy to:
California Department of Toxic Substances Control Region 1 (Attn: Jim Pinasco)
California Regional Water Quality Control Board, SFBAY (Attn: Laurent Meillier)
Contra Costa County Environmental Health, LEA (Attn: Agnes T. Vinluan)
Cal/EPA Integrated Waste Management Board Permitting & Enforcement Division (Attn: Frank Davies)
California Department of Fish and Game (Attn: Frank Gray)
Restoration Advisory Board (RAB) Co-Chair (Attn: Ms. Mary Lou Williams)
RAB Member Lisa Anich
RAB Member Kevin Cornish
RAB Member David Griffith
RAB Member Gregory Glaser
RAB Member Jessica Hamburger
RAB Member Ed McGee
RAB Member Mario Menesini
RAB Member Ray O'Brien
RAB Member Igor Skaredoff
Clearwater Consultants (Attn: Patrick Lynch)
Tech Law, Inc. (Attn: Jennifer Hollingsworth)
NWS Seal Beach, N45WS (Attn: Margaret Wallerstein)
NWS Seal Beach, N09WS (Attn: Gregg Smith)
EFD Southwest (3) (Diane Silva- Admin Record/IR/Base copy)
IPT West (Attn: Lik-See Chung)
TtEMI San Francisco (Attn: Joanna Canepa)
TtEMI San Francisco (Attn: John Bosche)

GENERAL SERVICES ADMINISTRATION
CONTRACT NUMBER GS-10F-0076K
DELIVERY ORDER NUMBER 62474-01-F-6036

Landfill Gas Characterization
Site 1 Tidal Area Landfill

Naval Weapons Station Seal Beach Detachment Concord
Concord, California

GSA.0032.0016

April 14, 2005

NAVFAC
Naval Facilities Engineering Command

Department of the Navy
Integrated Product Team, West
Daly City, California

TETRA TECH, INC.

GENERAL SERVICES ADMINISTRATION
Contract Number: GS-10F-0076K
Delivery Order: N62474-01-F-6036
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Landfill Gas Characterization
Site 1 Tidal Area Landfill
Naval Weapons Station Seal Beach Detachment Concord
Concord, California

April 14, 2005

Prepared for

DEPARTMENT OF THE NAVY
Integrated Product Team West
Daly City, California

Prepared by:

TETRA TECH EM INC.
135 Main Street, Suite 1800
San Francisco, California 94105
(415) 543-4880

John Bosche, P.E., Project Manager

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ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	Micrograms per cubic meter
ACGIH	American Council of Governmental Industrial Hygienists
ASTM	American Society for Testing and Materials
BAAQMD	Bay Area Air Quality Management District
CARB	California Air Resources Board
CCR	*California Code of Regulations*
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIWMB	California Integrated Waste Management Board
EPA	U.S. Environmental Protection Agency
FS	Feasibility study
GC/MS	Gas chromatography/mass spectrometry
GMP	Gas monitoring probe
HSC	California Health and Safety Code
IRP	Installation restoration program
LEL	Lower explosive limit
NGVD	1929 National Geodetic Vertical Datum
NWS SBD Concord	Naval Weapons Station Seal Beach Detachment, Concord
OSHA	Occupational Safety and Health Administration
PEL	Permissible exposure limit
ppbv	Parts per billion by volume
ppm	Parts per million
ppmv	Parts per million by volume
PRC	PRC Environmental Management, Inc.
PRG	Preliminary remediation goal
QA	Quality assurance
QC	Quality control
QCSR	Quality control summary report
RD	Remedial design
RI	Remedial investigation
ROD	Record of decision

SAP	Sampling and analysis plan
SI	Site investigation
Tetra Tech	Tetra Tech EM Inc.
TO	Toxic organic
VOC	Volatile organic compound

EXECUTIVE SUMMARY

INTRODUCTION

Tetra Tech EM Inc. (Tetra Tech) has prepared this evaluation to assess the types and concentrations of landfill gas generated in the landfill and to provide sufficient information to design handling systems for landfill gas, including vents or active controls, as necessary. This evaluation was prepared under the direction of the U.S. Department of the Navy, Integrated Product Team West, Daly City, and in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Tidal Area Landfill (Site 1 Landfill) at Naval Weapons Station Seal Beach Detachment, Concord (NWS SBD Concord), is being closed under the CERCLA process. The process of closing the landfill includes construction of a landfill cover and vents to release trapped landfill gas.

The Navy collected the data for this investigation in accordance with the protocols set forth in the "Final Landfill Gas Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan) for Site 1 Tidal Area Landfill at Naval Weapons Station Seal Beach Detachment Concord, Concord, California" (Tetra Tech EM Inc. [Tetra Tech] 2005).

The purpose was to conduct a landfill gas survey using the standards in California's Health and Safety Code (HSC) Section 41805.5, California Air Resources Board (CARB) guidelines to evaluate whether any landfill gas control (active or passive venting or oxidation) system is necessary to protect human health and the environment and comply with the requirements of Section 20921 of Title 27 *California Code of Regulations* (CCR). The information presented in this report will be incorporated into the design of the gas venting system.

This report presents the results of the integrated surface sampling at selected locations on the landfill surface. The data for surface emissions obtained from the integrated sampling event will be used to characterize the landfill gas at the Tidal Area Landfill and support the closure design in accordance with Section 20921 of Title 27 CCR.

As part of the final landfill gas and sampling and analysis plan (Tetra Tech 2005), perimeter landfill gas monitoring probes (GMP) will be installed and sampled in the future before and after the landfill cap is installed to evaluate the concentration of gas and the effect of the cover on migration of gas, if any.

This report describes the site, provides background information on the history of the site, and summarizes previous investigation reports prepared for the property.

REGULATORY STANDARDS

Section 20921 of Title 27 CCR regulates gas monitoring and control during closure and post-closure of landfills, and the record of decision (ROD) finds this regulation applicable to closure of the Site 1 landfill (Tetra Tech 2004). Section 20921 of Title 27 CCR requires that (1) the

concentration of methane gas must not exceed 1.25 percent by volume in air within on-site structures, (2) the concentration of methane gas migrating from the landfill must not exceed 5 percent by volume in air at the facility property boundary or at an alterative boundary established by and monitored with GMPs, and (3) trace gases be controlled to prevent adverse acute and chronic exposure to toxic or carcinogenic compounds.

Parts 2 and 3, but not part 1, described above are applicable to the landfill because structures are not proposed. Part 2 is assessed by measuring methane at the landfill, and Part 3 is assessed by measuring the presence and concentrations of trace gases and then comparing them with various regulatory criteria.

Three regulatory criteria are used for this evaluation. These include Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) as the primary criteria, and California Air Toxics "hot spots" rules by CARB and the U.S. Environmental Protection Agency (EPA) Region 9 preliminary remediation goals (PRG) developed under the Superfund program as secondary criteria.

INVESTIGATION METHODS

This report presents a detailed description of the methods used to assess the nature of landfill gas generated at the site. The presence of landfill gas at the Tidal Area Landfill was measured using the California Integrated Waste Management Board (CIWMB) guidelines for integrated surface sampling (CIWMB 1997). The integrated surface sampling is a method of characterizing emissions from a disposal site. Integrated surface sampling is designed to sample landfill gas, if present, immediately after being emitted from the landfill surface and having entered the atmosphere.

Sample locations were selected in the field to evaluate potential emissions of landfill gas from the surface of the landfill. Locations for samples were selected so all major portions of the landfill were sampled for gas emissions.

Background concentrations were measured following CARB procedures, and the surface of the landfill was screened to evaluate potential landfill gas emissions. Surface monitoring points were identified in the field and included selected surface cracks. In-field surface screening was used to measure methane, oxygen, carbon monoxide, carbon dioxide, nitrogen, and hydrogen sulfide. Eight samples were collected using Summa canisters from the locations that exhibited the highest concentration of methane. Summa canisters were transported to a Navy-approved, California state-certified laboratory and were analyzed for volatile organic compounds (VOCs) using EPA Method TO-15 and for fixed gases using TO-3M and American Society for Testing and Materials (ASTM) test method ASTM D 1946.

The sampling methods, including sample handling and chain of custody, are detailed in the text of this report. Quality control methods are described and a quality control summary report is included as Appendix D.

INVESTIGATION RESULTS

On February 2, 2005, field personnel collected 33 field screening readings at the Site 1 Landfill and collected 10 Summa canisters for laboratory analysis. These 10 Summa canisters included eight samples, one duplicate sample, and one up-wind sample of ambient air.

Field screening results indicated that methane concentrations vary at the site from 0 to 280 parts per million (ppm). The average of all methane readings was 67 ppm. Carbon monoxide was not detected at any field screening location, and oxygen was consistently read at concentrations of 20.7 to 20.9 percent. All readings of the lower explosive limit were zero, as were all readings of hydrogen sulfide. These results varied widely and were not confirmed by the more accurate laboratory analytical methods. Since this landfill is located near heavily industrialized areas, the field screening results may have been influenced by contaminants in the air that blow onto the site.

Laboratory analytical results for methane were lower than the concentrations detected using field screening equipment. Detected methane in the ambient air sample was 3.0 parts per million by volume (ppmv) and concentrations in the samples collected varied from 2.5 to 3.1 ppmv. The difference between field screening concentrations and concentrations measured in the laboratory can arise from two factors. First, the laboratory instrumentation is generally more accurate than the field methods. Second, the laboratory protocol detects and quantifies only the methane present in the sample, whereas the field screening adds other organic vapors to the reported concentration of methane.

Laboratory analytical results for non-methane VOCs indicated that 14 of the 43 target compounds were detected in at least one of the ten samples collected. Of the 14 compounds that were detected, 7 of them were detected from only one sample. One compound, acetone, was detected in the ambient air sample (0321LFG001) at levels consistent with concentrations found in two other samples and should be regarded as a background gas in those samples. Therefore, only five of the detected compounds were found in more than one location in the landfill at levels above concentrations in ambient air.

COMPARISON WITH SCREENING CRITERIA

None of the non-methane VOCs exceeds the primary screening criteria selected for this project, OSHA PELs. Of the detected constituents, maximum concentrations were approximately 10,000 times (four orders of magnitude) lower than OSHA PELs for an 8-hour time-weighted average.

As previously indicated, detected concentrations were also compared with CARB inhalation values and EPA PRGs. None of the reported concentrations approached or exceeded the CARB-approved risk assessment health values for noncarcinogenic risks. The reported results ranged from one to more than three orders of magnitude lower than the CARB values (see Table 5).

The final screen was a comparison to EPA Region 9 PRGs for ambient air. The reported concentrations of only four detected compounds exceeded the EPA Region 9 PRG. Each of the PRG criteria that were exceeded is based on cancer risk. Because of the methodology used to establish PRGs for cancer risk, these numbers tend to be set to low concentrations relative to noncarcinogenic VOCs.

CONCLUSIONS

All values measured in the field and in the laboratory suggest that very low concentrations of methane are being produced by the landfill. The remedial design includes installation and future monitoring of GMPs to evaluate potential landfill gas migration, as required under Title 27 CCR. Based on the information in this report, active landfill gas control systems will not likely be necessary in the future to prevent concentrations of methane in excess of the regulatory limit of 5.0 percent by volume in air in samples of landfill gas collected from the GMPs, as established by Section 20921(a)(2) Title 27 CCR.

Although it appears that the landfill is not generating sufficient landfill gas to require active or passive landfill gas control systems venting is a prudent and inexpensive precaution that significantly reduces the possibility of off-site landfill gas migration and venting is required by the ROD. Therefore, the remedial design includes landfill gas vents.

Section 20921 of Title 27 CCR requires that trace gases be controlled to prevent adverse acute and chronic exposure to toxic or carcinogenic compounds. The results of this landfill gas evaluation indicate that acute and chronic exposures to these gases are unlikely as a result of gas generated from the Site 1 Tidal Area Landfill.

None of the nonmethane VOC trace gas concentrations exceeds either OSHA PELs or CARB inhalation values for acute or chronic exposures. Although four laboratory analytical samples had concentrations of constituents that exceeds Region 9 PRGs, the concentrations do not suggest acute or chronic exposure risks.

1.0 INTRODUCTION

Tetra Tech EM Inc. (Tetra Tech) has prepared this evaluation to assess the types and concentrations of landfill gas generated in the landfill and to provide sufficient information to design handling systems for landfill gas, including vents or active controls, as necessary. This evaluation was prepared under the direction of the U.S. Department of the Navy, Integrated Product Team West, Daly City, and in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The Tidal Area Landfill (Site 1 Landfill) at Naval Weapons Station Seal Beach Detachment, Concord (NWS SBD Concord) is being closed under the CERCLA process. The process of closing the landfill includes construction of a landfill cover and vents to release trapped landfill gas. This evaluation assesses the types and concentrations of landfill gases generated in the landfill and provides sufficient information to design handling systems for landfill gas, including vents or active controls, as necessary. Figure 1 shows the location of the Site 1 Landfill.

A final record of decision (ROD) was completed under CERCLA for the cover at the Site 1 Landfill (Tetra Tech 2004). The ROD identifies the substantive closure standards for the remedial design (RD), which is the next phase of the CERCLA process. The RD requires development of design documents that contain the elements of a closure plan as described in Title 27 *California Code of Regulations* (CCR) Sections 21769 and 21830.

The Navy collected the data for this investigation in accordance with the protocols set forth in the "Final Landfill Gas Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan) for Site 1 Tidal Area Landfill at Naval Weapons Station Seal Beach Detachment Concord, Concord, California" (Tetra Tech EM Inc. [Tetra Tech] 2005). The purpose was to conduct a landfill gas survey using the standards in California's Health and Safety Code (HSC) Section 41805.5, California Air Resources Board (CARB) guidelines to evaluate whether any landfill gas control (active or passive venting or oxidation) system is necessary to protect human health and the environment and comply with the requirements of Section 20921 of Title 27 CCR. The information presented in this report is incorporated into the design of the gas venting system.

If concentrations of gas detected during the survey exceed the requirements in Title 27 CCR 20921(a)(2) for gas migration, then the Navy would design and construct a landfill gas control system in consultation with county, state, and federal regulators. Surface screening and sampling for laboratory analysis were used to evaluate whether the landfill is generating gas that could pose a threat to health.

Although the analytical results for samples of landfill gas that are reported in this document provide useful information to design systems to handle or vent landfill gas, its migration cannot be assessed without installing and sampling gas monitoring probes (GMPs). Details on installing and sampling GMPs are included in the final landfill gas sampling and analysis plan (SAP) (Tetra Tech 2005). The landfill cover construction contractor will install the subsurface GMPs before the cover is complete to monitor migration of gas before and after the cap is installed to evaluate the concentration of gas and the effect of the cover on migration of gas, if any.

The proposed GMPs will be installed to evaluate compliance with the requirements of Title 27 CCR Section 20921 (a)(2). As described in the landfill gas SAP, samples will be analyzed for methane, carbon dioxide, hydrogen sulfide, and the trace gases commonly found in landfills.

1.1 PURPOSE OF INVESTIGATION

The purpose of this investigation is to assess the concentration and makeup of landfill gas generated by the landfill and to evaluate whether any control system (active or passive venting or oxidation) is necessary to protect human health and the environment. The results of this study are incorporated in the design of the landfill the gas control system.

This report presents the results of the integrated surface sampling at selected locations on the landfill surface. The data from the integrated sampling event for surface emissions will be used to characterize the landfill gas at the Tidal Area Landfill and support the closure design in accordance with Section 20921 of Title 27 CCR.

Closure per Section 20921 of Title 27 CCR requires that (1) the concentration of methane gas must not exceed 1.25 percent by volume in air within on-site structures, (2) the concentration of methane gas migrating from the landfill must not exceed 5 percent by volume in air at the facility property boundary or at an alterative boundary established by and monitored with GMPs, and (3) trace gases be controlled to prevent adverse acute and chronic exposure to toxic or carcinogenic compounds.

As part of the final landfill gas SAP (Tetra Tech 2005), perimeter landfill GMPs will be installed and sampled in the future before and after the landfill cap is installed to evaluate the concentration of gas and the effect of the cover on gas migration, if any.

1.2 SITE DESCRIPTION AND BACKGROUND

The Tidal Area Landfill is located along the western side of Johnson Road, just north of Froid Road (Figure 1). The Tidal Area Landfill, which covers 13 acres, served as the major disposal area for NWS SBD Concord from approximately 1944 to 1979. During that time, the landfill received household refuse from the base and surrounding communities, as well as facility waste and construction debris. The landfill reportedly received solvents, acids, paint cans, creosote-treated timbers, asphalt, concrete, asbestos, and ordnance materials, including inert munitions. The landfill is estimated to contain 200,000 tons of waste. An inundated salt marsh wetland is located adjacent to and along the western and southern boundaries of the landfill (Figure 2). The closest civilian population is 1.3 miles south of the landfill.

The Tidal Area at NWS SBD Concord is located on a site that was originally (from 1901 to 1908) occupied in part by a copper smelting operation and later by the Pacific Coast Shipbuilding Company. At that time, the area was known as “Bay Point.” The copper smelting and ship building operations occurred in the area north of what is now the Tidal Area Landfill. The distance from the landfill to the former smelting and shipbuilding operations is estimated to

be more than 1,000 feet. Otter Slough was constructed to drain surface water and groundwater from the Tidal Area to Suisun Bay. The slough is believed to have passed through the current location of the Tidal Area Landfill. The portion of this slough that passed through the present location of the Tidal Area Landfill was backfilled, and the slough was rerouted around the Tidal Area Landfill during construction of NWS SBD Concord in 1942.

According to the initial assessment study (Ecology and Environment [E&E] 1983), the explosive "tritonal" from a 750-pound, general-purpose bomb was reportedly buried in the landfill. The initial assessment study, however, did not cite the source of this information. In addition, subsequent inquiries also have not identified the source of the information. Navy sources consider disposal of tritonal highly unlikely because the protocol for disposal of explosives does not sanction landfill disposal of potentially live munitions. Furthermore, other safe and appropriate disposal methods for this type of material were in practice at the time. If tritonal was disposed of in violation of Navy rules, it is likely to be degraded by exposure to the elements. Degradation of tritonal by weathering tends to increase the stability of the material (Tetra Tech 2001, 2003).

Historical photographs indicate that the Tidal Area Landfill was created by the progressive disposal of debris placed directly on native soil outward from Johnson Road. Apparently, the area was not excavated before waste was discarded there. Waste as much as 10 feet thick was estimated from topographic evaluation; however, the waste may be unevenly distributed, and the ratio of waste to soil cover in the fill may be variable. There is no record of the degree of landfill subsidence that resulted from consolidation of the underlying Bay Mud. The area is currently covered by soil; however, the origin of the soil cover is unknown. A fence borders the edge of the landfill along Johnson Road but does not surround the landfill.

Groundwater elevations measured from December 1989 to January 1998 at the Tidal Area Landfill ranged from 3.20 feet below 1929 National Geodetic Vertical Datum (NGVD) to 3.54 feet above NGVD. Except for a few wells or measurement periods, water levels in the wells at the site were highest near the end of the wet season and lowest near the end of the dry season. The response of water levels in wells at the landfill to seasonal rainfall indicates that groundwater is recharged by infiltration of precipitation. It is clear that at least a portion of the waste is inundated because the waste has been measured at up to 10 feet thick at the landfill.

The horizontal extent of the landfill has been established with a high degree of certainty based on historical aerial photographs and visual site inspections. The boundary of the landfill on the eastern side is delineated by a road; on the northern, southern, and western sides, the boundary is visually apparent as a sudden change in slope from the flat wetland to the raised mound of the landfill.

The landfill consists predominantly of ruderal non-native grassland habitat. The surface of the landfill is discontinuous soil cover that is mixed with waste throughout the depth of the landfill. Currently, rubble, metal scraps, and wood debris are visible through the layer of soil. Differential subsidence and decomposition of waste have resulted in a highly uneven surface interrupted by deep potholes.

1.3 SUMMARY OF PREVIOUS INVESTIGATIONS

The following investigations were conducted at the Tidal Area Landfill and surrounding areas.

1.3.1 Historical Environmental Assessments of the Landfill

A summary of environmental investigations conducted at NWS SBD Concord before the remedial investigation (RI) is provided below. Although the investigations are described using the Installation Restoration Program (IRP) terms that were used before the Navy adopted the U.S. Environmental Protection Agency's (EPA's) terminology, the investigations are consistent with the CERCLA process. The investigations encompassed all four sites within the Tidal Area of NWS SBD Concord. The information summarized in the following paragraphs, however, applies only to the Tidal Area Landfill.

The site was first investigated during an initial assessment study in 1983 (E&E 1983). The initial assessment study consisted of a search of historical records, a visual inspection of the site, and interviews with personnel at NWS SBD Concord. Based on the historical information, the site was recommended for further study. A site investigation (SI) of the Tidal Area Landfill was subsequently conducted from April 1988 to January 1991. Samples of groundwater, surface water, soil, and sediment were collected within the Tidal Area Landfill. Results revealed the presence of volatile organic compounds (VOC), semivolatile organic compounds, polynuclear aromatic hydrocarbons, the pesticide dieldrin, the polychlorinated biphenyl Aroclor-1260, metals, and the nitroaromatic explosive compound nitrobenzene. The Navy documented its intent to use a presumptive remedy approach in December 1994 in the draft final work plan for the RI/feasibility study (FS) for Tidal Area sites (PRC Environmental Management, Inc. [PRC] 1994). A multilayer prescriptive soil cap for a municipal solid waste landfill that meets the requirements of Title 27 CCR was proposed and has been selected for the site based on EPA's presumptive remedy guidance for CERCLA municipal landfill sites (EPA 1993).

The boundary of the Tidal Area Landfill site, as defined in the SI report, was larger than the current boundary shown on Figure 1. The landfill area was defined during the SI to include the landfill itself and a bordering zone of potential influence. The boundary was modified in the RI, however, to reduce the size to be equal to the area where the waste was deposited. As a result, many of the SI sampling locations for the Tidal Area Landfill are outside the boundary of the landfill as it is currently defined. Samples from those locations were collected within the wetland area now called the R Area, Site 2.

A confirmation sampling study was conducted in 1993 to confirm the results of quarterly sampling during the SI. A limited number of soil, sediment, and groundwater samples were analyzed to verify the extent of organic constituents in groundwater. No organic compounds or pesticides were detected in these samples (PRC and Montgomery Watson 1993).

1.3.2 Remedial Investigation and Confirmation Groundwater Sampling Study for the Tidal Area

Data collected during the SI and the 1993 confirmation sampling study were used in planning the RI at the Tidal Area Landfill. A confirmation sampling study for groundwater was later conducted in September and October 1997 to address outstanding questions that involved hydrology and groundwater in the Tidal Area (Tetra Tech 1998). The nature and extent of contamination at the Tidal Area Landfill are described in the ROD (Tetra Tech 2004). The ROD also described the chemicals of potential concern based on the RI screening criteria and the confirmation groundwater sampling study.

1.4 TECHNICAL OR REGULATORY STANDARDS

In the San Francisco Bay Area, the San Francisco Bay Area Air Quality Management District (BAAQMD) regulates air emissions from landfills in Regulation 8, Rule 34. The rule limits emissions of organic compounds and methane from solid waste disposal sites. As documented in the ROD, the Navy has concluded that Site 1 is exempt from this regulation because it does not meet the minimum volume requirement of 1 million tons of waste.

Section 20921 of Title 27 CCR regulates gas monitoring and control during closure and post-closure of landfills, and the ROD finds this regulation applicable to closure of the Site 1 landfill. Section 20921 of Title 27 CCR requires that (1) the concentration of methane gas must not exceed 1.25 percent by volume in air within on-site structures, (2) the concentration of methane gas migrating from the landfill must not exceed 5 percent by volume in air at the facility property boundary or at an alterative boundary established by and monitored with GMPs, and (3) trace gases must be controlled to prevent adverse acute and chronic exposure to toxic or carcinogenic compounds. Each of these three requirements is discussed below:

1. No structures are proposed at the landfill and there are no existing structures, so methane cannot collect within structures there.

2. Migration of methane at concentrations exceeding 5 percent by volume at the perimeter boundary or alternative boundary is prohibited. This report evaluates the possibility that methane will accumulate in the future while the landfill gas control system, consisting of landfill gas vents, is in place. Regardless of the presence or type of landfill gas control systems, Section 20921 of Title 27 CCR requires monitoring at the perimeter boundary or at the alternative boundary. Monitoring is incorporated in the design via the proposed GMPs.

3. Although Section 20921 of Title 27 CCR requires that trace gases be controlled to prevent acute and chronic exposures, Section 20921 does not set forth specific applicable criteria for the evaluation. The Navy therefore assumes that Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) (OSHA 2003) will be the action levels applied to this site; current OSHA PELs are listed in Appendix A.

OSHA PELs have been used for the initial screening of field and analytical results for all trace gases in this evaluation. However, guidance levels are also provided from two additional regulatory agency sources for comparison. Since this site is located in California, the California Air Toxics "hot spots" rules by CARB identifies and estimates acceptable risks for numerous toxic air pollutants. Risks from exposure based on carcinogenicity are estimated by EPA Region 9 preliminary remediation goals (PRG) developed under the Superfund program. All three screening criteria, from OSHA, CARB, and EPA, are presented in Appendix A, and the concentrations of trace gas detected from landfill gas sampling are compared with each of these screening criteria in Section 4.0 of this report.

None of the above screening criteria are listed in the ROD as regulations that are considered to be applicable or relevant and appropriate regulations (ARAR) for the Site 1 landfill. However these criteria are useful as a point of reference for comparison with detected concentrations at the landfill to evaluate if there is a potential for human exposure to trace gases at concentrations which may cause chronic or acute health effects. Section 20921(a)(3) Title 27 CCR is an ARAR for Site 1 and the regulation prohibits chronic and acute exposures to landfill gas.

Although these screening criteria are useful for comparison, each is based upon exposure conditions that do not resemble conditions which may be expected at the landfill. In addition, there are significant differences between each of the regulatory screening criteria in part due to differing exposure assumptions. The exposure assumptions associated with each screening criteria differ from the landfill exposure conditions in several ways and the most pertinent are listed below:

- Landfill gas measurements have been taken on the existing uncovered surface of the landfill. The provisions of Section 20921(a)(3) Title 27 are applicable to the potential for exposure to the covered landfill. Because the landfill cover will make use of a compacted low permeability layer, the current measurements overestimate the anticipated concentrations of landfill gas that will escape through the cover.

- Landfill gas measurements have been collected at the surface of the landfill and each of the screening criteria are intended for evaluation of gas concentrations within the breathing zone.

- With the exception of acute screening criteria, the regulatory criteria assume long-term exposure over a time period of at least 8 hours or occupancy over a significant portion of one's lifetime.

Specific comparisons of field and laboratory analytical results to the screening criteria are presented in Section 4.0 of this report and conclusions are summarized in Section 5.0.

2.0 INVESTIGATION METHODS

The following sections detail the methods used in the investigation to characterize landfill gas.

2.1 MEASUREMENT

The presence of landfill gas at the Tidal Area Landfill was measured using the California Integrated Waste Management Board (CIWMB) guidelines (CIWMB 1997) for integrated surface sampling. The following sections discuss screening of surface emissions, landfill gas sampling, and the analytical suite.

The integrated surface sample is a method of characterizing emissions from a disposal site. Integrated surface sampling is designed to sample the emissions of landfill gas immediately after they have passed through the final cover and have entered the atmosphere. Use of more sensitive analytical methods is necessary to adequately characterize the sample, however, because the sampling system will dilute the landfill gas emitted.

Sample locations were selected in the field to evaluate potential emissions of landfill gas from the surface of the landfill. Locations for samples were selected so that all major portions of the landfill are sampled. The locations of landfill gas screening and sampling points are indicated on Figure 3, the Sampling Location Map.

Background concentrations were measured following CARB procedures, and the surface of the landfill was screened to evaluate potential emissions of landfill gas. Surface monitoring points were identified in the field and included selected surface cracks. A landfill gas analyzer (Gastech model GT-408) was used in the field to measure methane, oxygen, carbon monoxide, carbon dioxide, and nitrogen. A portable hydrogen sulfide analyzer (Gastech model GT-402) was used to measure levels of hydrogen sulfide. Samples were collected from the locations that exhibited the highest concentration of methane and were analyzed for VOCs using EPA Method TO-15 and for fixed gases using Toxic Organic (TO)-3M and American Society for Testing and Materials (ASTM) D 1946. Samples were analyzed at a Navy-approved and California state-certified laboratory. The rationale for selecting these sample locations is presented in the sampling and analysis plan (Tetra Tech 2005).

Based on the surface screening results, eight landfill gas samples were collected and analyzed for VOCs using TO Method 15 and for fixed gases using TO-3M and ASTM Standard D 1946 at an off-site laboratory. The eight samples were collected from various locations within the landfill based on (1) locations of surface screening samples where the highest concentrations of VOCs were detected or (2) representative areas of the landfill. One duplicate sample was collected, and one sample of the ambient air was collected.

2.2 SAMPLING METHODS

This section describes the procedures used to collect samples, including sampling methods and equipment, sample preservation requirements, decontamination procedures, and management of investigation-derived waste. Table 1 summarizes the analytical and the field screening methods used during the landfill gas characterization.

Landfill gas was screened in the field at the surface of the landfill and at the locations of perimeter monitoring probes using the GT-408 landfill gas analyzer to measure methane, oxygen, carbon monoxide, carbon dioxide, and nitrogen. A GT-402 portable hydrogen sulfide analyzer was used to measure levels of hydrogen sulfide.

Landfill gas samples for laboratory analysis were collected in Summa canisters. If areas had been found where hydrogen sulfide measurements exceeded 10 parts per million (ppm), the samples were to be collected in a Tedlar bag. All hydrogen sulfide measurements were below 10 ppm; however, so Tedlar bags were not required.

2.3 SAMPLE HANDLING AND CUSTODY

Procedures for sample handling, including sample identification and labeling, documentation, chain-of-custody, and shipping, were carried out as described in the sampling and analysis plan (Tetra Tech 2005). The locations of screening samples and Summa canister samples are indicated on Figure 3. Chain-of-custody records are included in Appendix B.

2.4 ANALYTICAL METHODS

Gaseous samples were analyzed for VOCs by full-scan gas chromatography/mass spectrometry (GC/MS) using EPA Method TO-15. The canister was pressurized with hydrocarbon-free air or nitrogen, and a sample aliquot was withdrawn from the whole-air sample in the Summa canister. This sample was passed through a mass-flow controller and then either cryofocused by liquid argon or concentrated using a multisorbent bed. The focused VOCs from the air sample were then flash-heated and passed through a hydrophobic drying system that removed water from the sample stream before the sample was analyzed by GC/MS. EPA Method TO-15 quantitated and speciated the standard target list of VOCs. In addition, the samples were analyzed for fixed gases using EPA Method TO-3M and ASTM D 1946.

2.5 QUALITY CONTROL

The precision and accuracy of the chemical measurements of gas samples in Summa canisters was assessed through a combination of field and laboratory quality control (QC) samples. Field QC samples consisted of a field duplicate, and laboratory QC samples consisted of a laboratory method blank. QC samples sent to the laboratory were collected and analyzed as described in the sampling and analysis plan.

Tetra Tech prepared a QC summary report (QCSR) that is submitted as Appendix D of this report. The QCSR includes a summary and evaluation of quality assurance and quality control (QA/QC), including any field or laboratory assessments, completed during the investigation. The QCSR emphasized whether data were of adequate quality to support the decisions required.

3.0 INVESTIGATION

The following sections provide the field screening and the laboratory analytical results.

3.1 FIELD SCREENING RESULTS

On February 2, 2005, field personnel collected 33 field screening readings at the Site 1 Landfill (Figure 3). Field screening results indicated that concentrations of methane vary at the site from 0 to 280 ppm. The average of all methane readings was 67 ppm. Carbon monoxide was not detected at any field screening location, and oxygen was consistently read at concentrations of 20.7 to 20.9 percent. All readings of the lower explosive limit were zero, as were all readings of hydrogen sulfide. Table 2 presents all field screening results for the soil-gas survey.

3.2 LABORATORY ANALYTICAL RESULTS

Field personnel collected eight landfill gas samples, one ambient air sample, and one duplicate sample in Summa canisters and submitted the samples to the Navy-approved laboratory for analysis by and EPA Methods TO-3M and TO -14A and ASTM D1946 (EPA 1999).

Laboratory analytical results for EPA Method TO-3M indicated that methane was present at the landfill surface at concentrations ranging between 2.5 parts per million by volume (ppmv) and 3.2 ppmv and that other analytes were not detected. Table 3 summarizes the laboratory results for VOCs by EPA Method TO-3M.

Laboratory analytical results for EPA Method TO-15 included reported detectible concentrations and detection limits for each analyte in two different sets of units. The first set of results, reported in micrograms per cubic meter ($\mu g/m^3$), is presented on Table 4. The second set of results is reported in parts per billion by volume (ppbv) on Table 5.

Detected constituents include trichlorofluoromethane (R-11), methylene chloride, carbon disulfide, vinyl acetate, 2-butanone, chloroform, benzene, toluene, tetrachloroethene, ethylbenzene, m,p-xylenes, styrene, and o-xylene. None of these VOCs was detected at concentrations of more than 10 $\mu g/m^3$, except for toluene (which was detected at 99 $\mu g/m^3$ in one sample).

Samples were analyzed by ASTM D1946 to measure the percentage of oxygen, nitrogen, and carbon dioxide in the samples submitted to the laboratory. All sample results were similar and within normal limits for air samples.

A complete summary of the analytical results for all laboratory tests is presented in Appendix C.

4.0 COMPARISION WITH SCREENING CRITERIA

This section evaluates the landfill gas screening and laboratory results relative to the applicable screening criteria.

4.1 FIELD SCREENING RESULTS

Field screening results are presented in Table 2. The results indicated that concentrations of methane vary at the site from 0 to 280 ppm. The average of all methane readings was 67 ppm. Although these readings are reported as methane, the field screening instrument does not distinguish between methane and other combustible VOCs. As a result, the concentration of methane detected in the field may actually be composed of methane plus other non-methane gases. All values measured indicated that the concentration of methane in landfill gas migrating from the site is well below the regulatory limit of 5.0 percent by volume in air at the perimeter GMPs. (This regulatory limit is established by Section 20921(a)(2) Title 27 CCR to control gas migration at the landfill perimeter.) In fact, these values are well below the 500 ppmv limit that would have been applicable if this landfill were subject to the more strenuous regulations for larger, newer landfills.

Carbon monoxide was not detected at any field screening location, and oxygen was consistently read at concentrations of 20.7 to 20.9 percent. All readings of the lower explosive limit were zero, as were all readings of hydrogen sulfide. These results varied widely and were not confirmed by the more accurate laboratory analytical methods. Since this landfill is located near heavily industrialized areas, the field screening results may have been altered by contaminants in the air that blow onto the site.

4.2 LABORATORY ANALYTICAL RESULTS

This section evaluates and compares the laboratory analytical results with the applicable screening criteria.

4.2.1 Methane Results

Laboratory analytical results for methane are presented in Table 3. Laboratory analytical results were lower than the methane concentrations detected using field screening equipment. Detected methane in the sample of ambient air was 3.0 ppmv, and concentrations in the samples collected varied from 2.5 to 3.1 ppmv. The difference between concentrations measured in the field versus in the laboratory may arise from two factors. First, the laboratory instrumentation is generally more accurate than the field methods. Second, the laboratory protocol detects and quantifies only the methane present in the sample, whereas the field screening falsely adds other organic vapors to the reported concentration of methane.

As indicated in Section 4.1, the field screening result for methane was well below the regulatory limit of 5.0 percent by volume in air at the site perimeter GMPs, as established by Section 20921(a)(2) Title 27 CCR to control gas migration at the landfill perimeter. Furthermore, the field screening values were also below the 500 ppmv limit that would have been applicable if this landfill were subject to the more strenuous regulations for larger, newer landfills. The very low concentrations of methane detected in the laboratory reinforce the same conclusion.

4.2.2 Nonmethane VOC Results

Nonmethane VOCs results are presented in Tables 4 and 5. As indicated in Tables 4 and 5, only 14 of the 43 target compounds were detected in at least one sample. Six of those compounds were detected in one sample from a single point on the landfill surface, while two others were detected in only one other sample. One compound, acetone, was detected in the ambient air sample (0321LFG001) at levels consistent with concentrations found in two other samples and should be regarded as a background gas. Therefore, only five of the detected compounds were found in more than one location in the landfill at levels above concentrations in ambient air.

4.2.3 Comparison with OSHA PELs and CARB Inhalation Values

As indicated in Table 5, none of the nonmethane VOCs exceeds the primary screening criteria selected for this project, the OSHA PELs. Of the detected constituents, maximum concentrations were approximately 10,000 times (four orders of magnitude) lower than OSHA PELs for an 8-hour, time-weighted average.

As previously indicated, detected concentrations area also screened against CARB inhalation values and EPA PRGs. None of the reported concentrations approached or exceeded the CARB-approved risk assessment health values for noncarcinogenic risks. The reported results ranged from one to more than three orders of magnitude lower than the CARB values (see Table 5).

4.2.4 Comparison with EPA Region 9 PRGs

The final screen was a comparison to EPA Region 9 PRGs for ambient air. The reported concentrations of only four detected compounds exceeded the EPA Region 9 PRGs. Each of the PRG that was exceeded is based on cancer risk. Because of the methodology used to establish cancer risk PRGs, they tend to be set at low concentrations relative to airborne concentration limits for noncarcinogenic VOCs.

In considering these comparisons of results, the EPA PRG values are set as safety benchmarks for the highest standard of land use, residential housing. Therefore, they are often lower than other screening criteria. In addition, the cancer-risk values from EPA are based on a standard assumption of a 70-year lifetime cancer risk of one cancer in one million persons who are exposed to the threshold level for an entire lifetime.

5.0 CONCLUSIONS

The two regulatory criteria evaluated in this report are the limitations on methane migration and the evaluation of toxic nonmethane landfill gas. Both are evaluated in this section of the report.

5.1 METHANE MIGRATION

All values measured in the field and in the laboratory suggest that very low concentrations of methane are being produced by the landfill. The remedial design includes installation and future monitoring of GMPs to evaluate potential migration of landfill gas, as required under Title 27 CCR. Based on the information in this report, active landfill gas control systems will not likely be necessary in the future to prevent concentrations at methane in excess of the regulatory limit of 5.0 percent by volume in air extracted from these GMPs, as established by Section 20921(a)(2) Title 27 CCR.

Although collected data suggests that the landfill is not generating sufficient landfill gas to require active or passive landfill gas control systems, landfill gas vents will be installed as a prudent and inexpensive precaution to significantly reduces the possibility of off-site landfill gas migrationand to meet the requirement of the ROD.

5.2 NONMETHANE LANDFILL GAS

Section 20921 of Title 27 CCR requires that trace gases be controlled to prevent adverse acute and chronic exposure to toxic or carcinogenic compounds. The results of this evaluation indicate that acute and chronic exposures to landfill gas are unlikely as a result of gas generated from the Site 1 Tidal Area Landfill.

None of the nonmenthane VOC trace gases exceed either OSHA PELs or CARB inhalation values for acute or chronic exposures. Although several values exceed Region 9 PRGs, the values exceeded do not suggest acute or chronic exposure risk, as further explained below.

Region 9 EPA PRGs should not be used for anything more than an indicator of potential risk in this study, for several reasons. First, the samples collected were gathered from the surface of the landfill as they exited the soil. As soon as these chemical compounds are released to the atmosphere, they immediately mix with ambient air flowing across the landfill surface by vertical and horizontal mixing of the layers of air. Therefore, on-site personnel and the surrounding community would be exposed to concentrations that should be significantly lower than were measured in these samples. Next, the exposure risks are further mitigated because no one lives on the landfill or at its boundary for an entire 70-year lifetime. Furthermore, even if this possibility is assumed, the natural variability in wind direction over time will prevent a nearby resident from receiving a full and continuous exposure to these chemicals. Finally, the chemical compounds identified by the laboratory are all common and are frequently found throughout the environment, with most being constituents of consumer products as well as being used in industrial settings.

Based on these observations and the considerations discussed above, the concentrations of VOCs found in these landfill gas samples do not appear to present a significant environmental or health risk based on current knowledge and risk assessment standards.

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FIGURES

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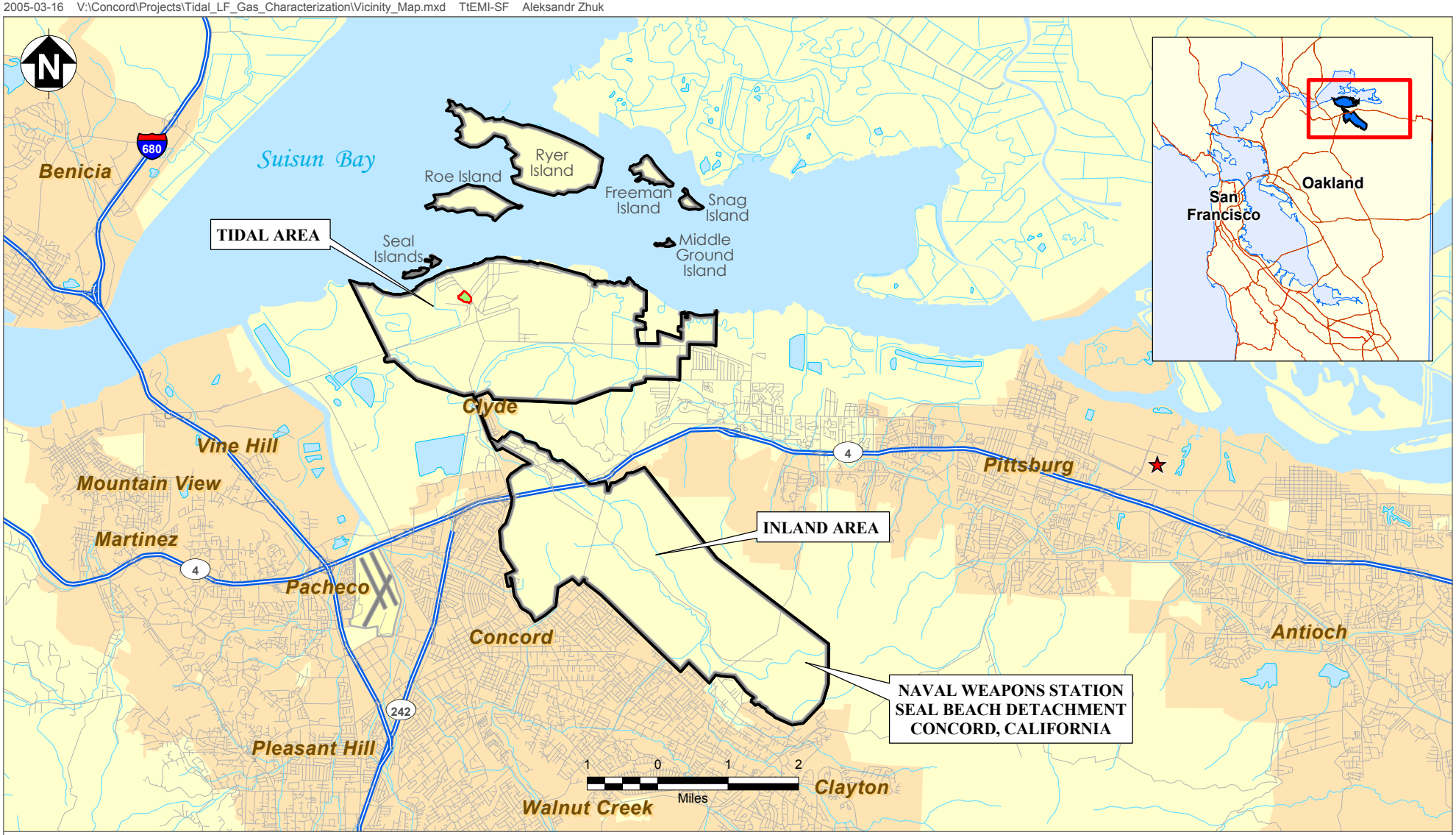


Naval Weapons Station Seal Beach Detachment, Concord, California

Tidal Area Landfill

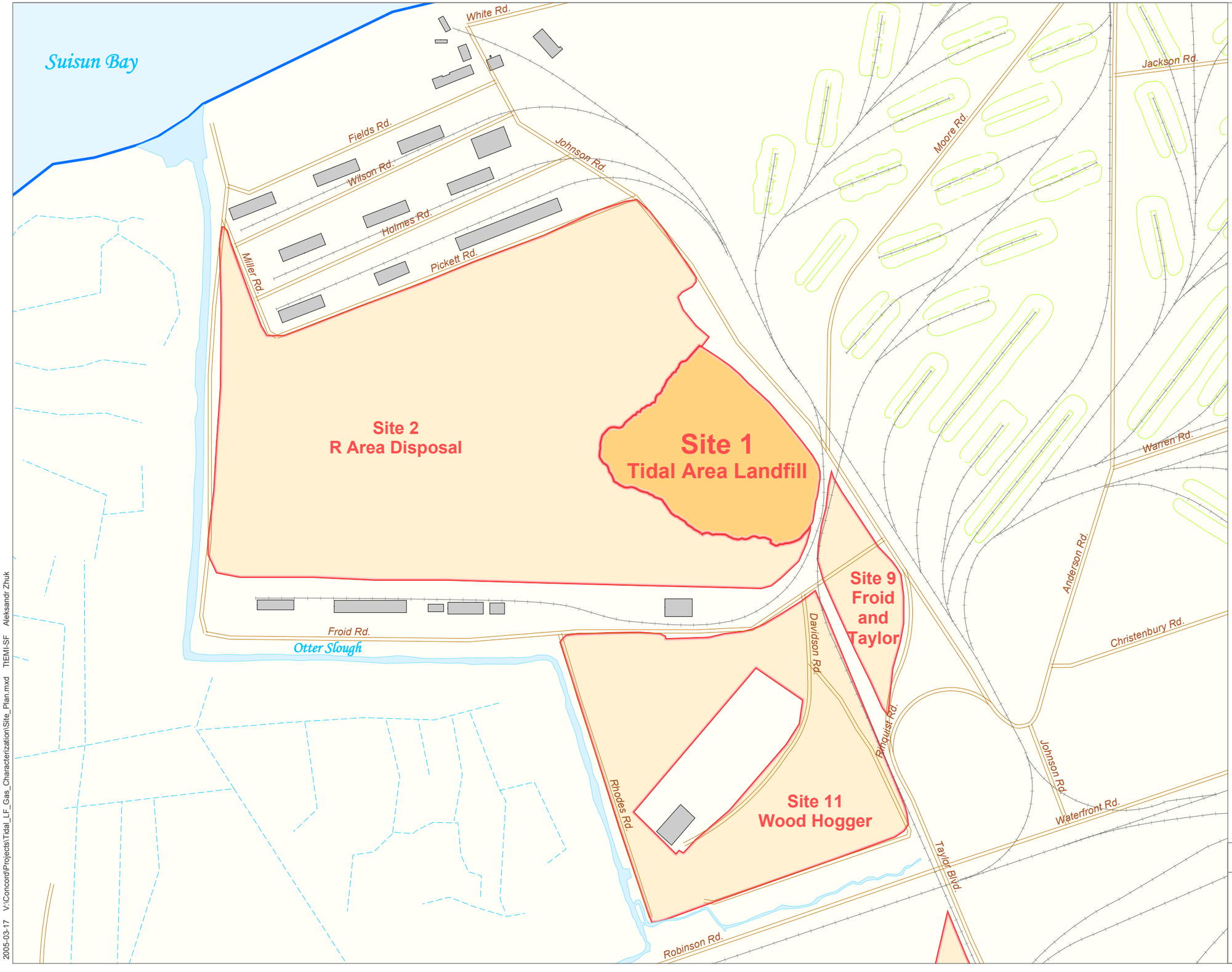
Radiography Facility

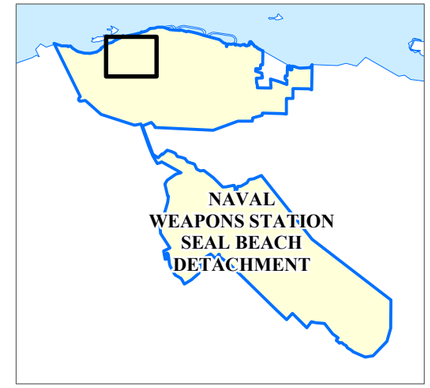
Tetra Tech EM Inc.

Naval Weapons Station Seal Beach Detachment
Concord, California
Integrated Product Team West, Daly City, CA

FIGURE 1
SITE VICINITY MAP

Landfill Gas Characterization
Site 1 Tidal Area Landfill





Investigation Site Boundary
Tidal Area Landfill Boundary
Navy Weapons Station Boundary
Building
Mosquito Ditch
Road
Railroad

400 0 400
Feet

Tetra Tech EM Inc.

Naval Weapons Station Seal Beach Detachment
Concord, California
Integrated Product Team West, Daly City, CA

FIGURE 2
SITE PLAN

Landfill Gas Characterization
Site 1 Tidal Area Landfill

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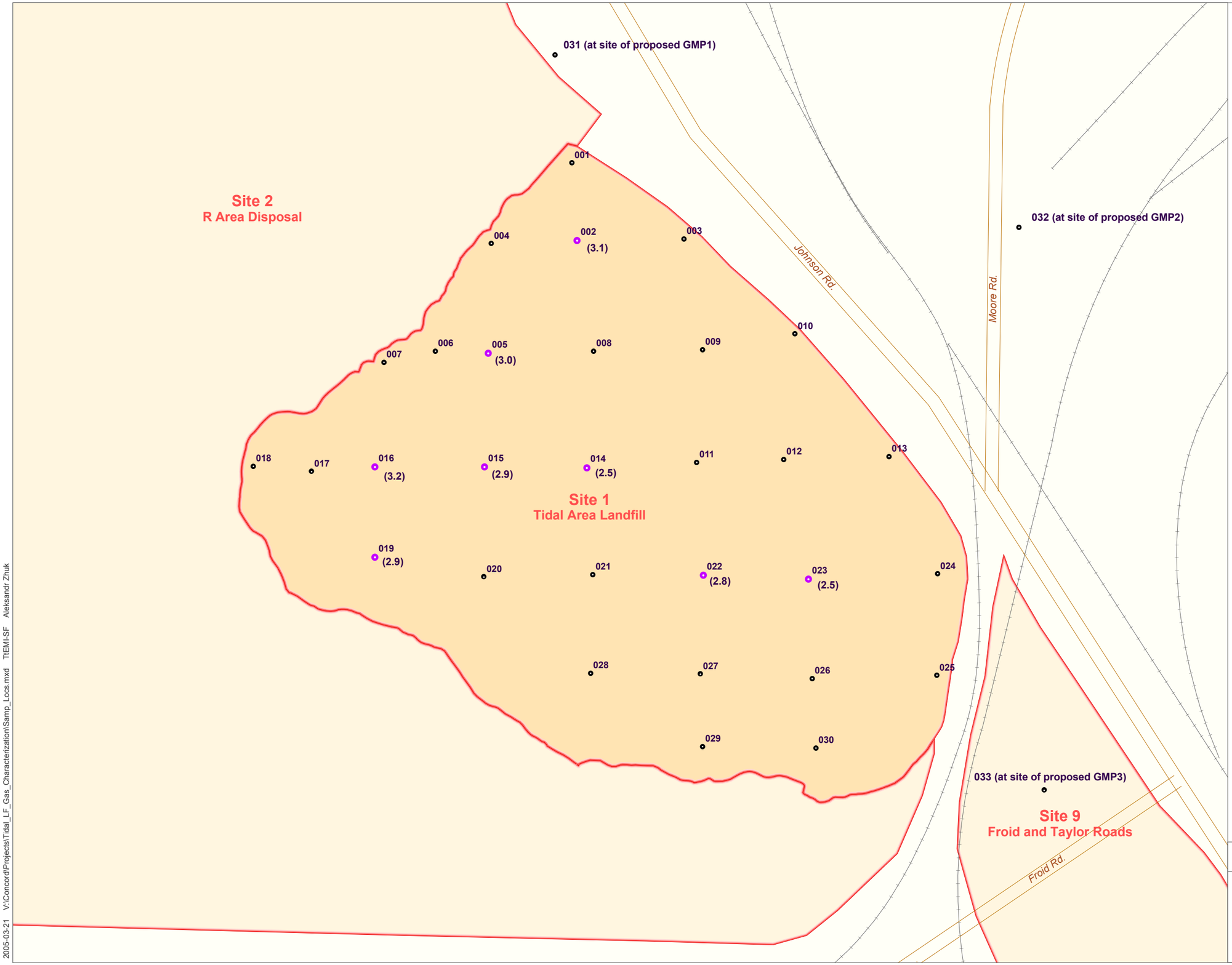

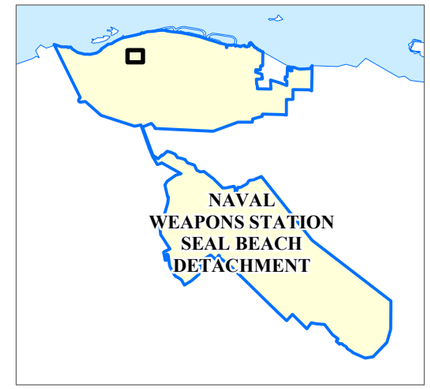

- Field Screening Location with Co-located Landfill Gas Sample Collected by Summa Canister and Analyzed in the Laboratory
- Field Screening Location
- Tidal Area Landfill Boundary
- Road
- Railroad

Notes:
1. Detected concentration of methane from laboratory analysis of Summa canister shown in parenthesis.
2. Location identification numbers indicated on this drawing are truncated for clarity. Actual identification numbers in the Navy's analytical results database

125 0 125
Feet

Tetra Tech EM Inc.

Naval Weapons Station Seal Beach Detachment
Concord, California
Integrated Product Team West, Daly City, CA

FIGURE 3
SAMPLING LOCATIONS MAP

Internal Landfill Gas Characterization
Site 1 Tidal Area Landfill

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TABLES

TABLE 1: ANALYTICAL AND FIELD SCREENING METHODS

Tidal Area Landfill (Site 1), Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Analysis	Method	Matrix	Holding Time (From Date Sampled)	Container	Preservative
Volatile Organic Compounds	EPA TO-15	Air	30 days for Summa canister 72 hours for Tedlar bag	Summa canister or Tedlar bag	None
Landfill Gases	ASTM D 1946	Air	30 days for Summa canister 72 hours for Tedlar bag	Summa canister or Tedlar bag	None
Landfill Gases	TO-3M	Air	30 days for Summa canister 72 hours for Tedlar bag	Summa canister or Tedlar bag	None
Methane, oxygen, carbon monoxide, carbon dioxide, and nitrogen	Gastech model GT-408	Air	N/A	N/A	N/A
Hydrogen sulfide	Gastech model GT-402	Air	N/A	N/A	N/A

Notes:

ASTM American Society for Testing and Materials
EPA U.S. Environmental Protection Agency
N/A Not applicable
TO Toxic organic

Source: EPA. 1999.

TABLE 2: FIELD SCREENING RESULTS

Tidal Area Landfill (Site 1), Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Location ID	Methane (ppm)	CO_2 %	O_2 %	LEL %	Hydrogen Sulfide (ppm)
0321TLSS001	40	0	20.8	0	0
0321TLSS002*	100	0	20.8	0	0
0321TLSS003	0	0	20.8	0	0
0321TLSS004	100	0	20.8	0	0
0321TLSS005*	80	0	20.8	0	0
0321TLSS006	40	0	20.8	0	0
0321TLSS007	40	0	20.9	0	0
0321TLSS008	60	0	20.7	0	0
0321TLSS009	0	0	20.9	0	0
0321TLSS010	0	0	20.9	0	0
0321TLSS011	0	0	20.9	0	0
0321TLSS012	0	0	20.9	0	0
0321TLSS013	0	0	20.9	0	0
0321TLSS014*	80	0	20.9	0	0
0321TLSS015*	40	0	20.9	0	0
0321TLSS016*	0	0	20.9	0	0
0321TLSS017	0	0	20.9	0	0
0321TLSS018	0	0	20.9	0	0
0321TLSS019*	80	0	20.9	0	0
0321TLSS020	0	0	20.9	0	0
0321TLSS021	0	0	20.9	0	0
0321TLSS022*	160	0	20.9	0	0
0321TLSS023*	240	0	20.9	0	0
0321TLSS024	80	0	20.9	0	0
0321TLSS025	60	0	20.9	0	0
0321TLSS026	180	0	20.9	0	0
0321TLSS027	100	0	20.9	0	0
0321TLSS028	0	0	20.9	0	0
0321TLSS029	40	0	20.9	0	0
0321TLSS030	40	0	20.9	0	0
0321GMP3	180	0	20.9	0	0
0321GMP2	180	0	20.9	0	0
0321GMP1	280	0	20.9	0	0

Notes:

* Summa sample collected

LEL Lower explosive limit

TABLE 3: RESULTS OF LANDFILL GAS SAMPLE ANALYSIS FOR LABORATORY METHANE ANALYSIS

Tidal Area Landfill (Site 1), Naval Weapons Station Seal Beach Detachment Concord, Concord, California

	Sample ID										
	0321LFG 001	0321LFG 002	0321LFG 003	0321LFG 004	0321LFG 005	0321LFG 006	0321LFG 007	0321LFG 008	0321LFG 009	0321LFG 010	Method Blank
	Location ID										
Analyte	AMBIENT Air	TLSS002	TLSS002 Duplicate	TLSS016	TLSS019	TLSS005	TLSS015	TLSS022	TLSS023	TLSS014	Not Applicable
Methane	**3.0**	**2.5**	**3.1**	**3.2**	**2.9**	**3.0**	**2.9**	**2.8**	**2.5**	**2.5**	**< 0.50**
Ethane	< 0.61	< 0.60	< 0.61	< 0.62	< 0.61	< 0.62	< 0.61	< 0.61	< 0.62	< 0.61	< 0.50
n-Propane	< 0.61	< 0.60	< 0.61	< 0.62	< 0.61	< 0.62	< 0.61	< 0.61	< 0.62	< 0.61	< 0.50
n-Butane	< 0.61	< 0.60	< 0.61	< 0.62	< 0.61	< 0.62	< 0.61	< 0.61	< 0.62	< 0.61	< 0.50
n-Pentane	< 0.61	< 0.60	< 0.61	< 0.62	< 0.61	< 0.62	< 0.61	< 0.61	< 0.62	< 0.61	< 0.50
n-Hexane	< 0.61	< 0.60	< 0.61	< 0.62	< 0.61	< 0.62	< 0.61	< 0.61	< 0.62	< 0.61	< 0.50
C6+ as n-Hexane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	**3.6**	< 1.2	< 1.2	< 1.0

Notes:

All results reported in parts per million by volume.

< 0.62 indicates that the compound was analyzed for, but not detected above the indicated laboratory reporting limit.

TABLE 4: RESULTS OF LANDFILL GAS SAMPLE ANALYSIS FOR LABORATORY SAMPLES IN MICROGRAMS PER CUBIC METER (µg/m^3)
Tidal Area Landfill (Site 1), Naval Weapons Station Seal Beach Detachment Concord, Concord, California

	Sample ID												
	0321LFG 001	0321LFG 002	0321LFG 003	0321LFG 004	0321LFG 005	0321LFG 006	0321LFG 007	0321LFG 008	0321LFG 009	0321LFG 010	Method Blank		
	Location ID												
Analyte	Ambient Air	TLSS002	TLSS002 Duplicate	TLSS016	TLSS019	TLSS005	TLSS015	TLSS022	TLSS023	TLSS014	Not Applicable	EPA Region 9 PRG	CARB Inhalation Value
													Acute / Chronic
Chloromethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**95**	NS / NS
Vinyl Chloride	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.11**	180,000 / 26
Bromomethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**5.2**	3,900 / 5
Chloroethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**2.3**	NS / 30,000
Acetone	**6.6**	< 6.1	< 6.1	< 6.2	**8.5**	**6.4**	< 6.2	< 31	< 6.3	< 6.1	< 5.0	**3,300**	NS / NS
Trichlorofluoromethane (R-11)	< 1.2	**1.4**	**1.2**	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**730**	NS / 700
1,1-Dichloroethene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**210**	NS / 70
Methylene chloride	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	**5.8**	< 1.0	**4.1**	14,000 / 400
Trichlorotrifluoroethane (R-113)	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**31,000**	NS / 700
Carbon Disulfide	< 1.2	< 1.2	**6.1**	< 1.2	**2.0**	**2.9**	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**730**	6,200 / 800
trans-1,2,-Dichloroethene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**73**	NS / NS
1,1-Dichloroethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**1.2***	NS / NS
Methyl tert-Butyl Ether	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**7.4**	NS / 800
Vinyl Acetate	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	**1.4**	56	< 6.1	< 1.3	< 1.2	< 1.0	**210**	NS / 200
2-Butanone (MEK)	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	**1.5**	< 1.2	< 6.1	< 1.3	**8.2**	< 1.0	**5,100**	13,000 / 1,000
cis-1,2-Dichloroethene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**37**	NS / NS
Chloroform	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	**1.6**	< 1.2	< 6.1	< 1.3	**2.1**	< 1.0	**0.083**	150 / 300
1,2-Dichloroethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.074**	NS / 400
1,1,1-Trichloroethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**2,300**	68,000 / 1,000
Benzene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	**3.7**	< 1.0	**0.25**	1,300 / 60
Carbon Tetrachloride	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.13**	1,900 / 40
1,2-Dichloropropane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.099**	NS / NS
Bromodichloromethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.11**	NS / NS
Trichloroethene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.017****	NS / 600
cis-1,3-Dichloropropene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.48*****	NS / NS
4-Methyl-2-pentanone (MIBK)	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**3,100**	NS / NS
trans-1,3-Dichloropropene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.48*****	NS / NS
1,1,2-Trichloroethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.12**	NS / NS

TABLE 4: LABORATORY ANALYTICAL RESULTS OF LANDFILL GAS SAMPLES IN MICROGRAMS PER CUBIC METER (µg/m^3) (Continued)
Tidal Area Landfill (Site 1), Naval Weapons Station Seal Beach Detachment Concord, Concord, California

	Sample ID												
	0321LFG 001	0321LFG 002	0321LFG 003	0321LFG 004	0321LFG 005	0321LFG 006	0321LFG 007	0321LFG 008	0321LFG 009	0321LFG 010	Method Blank		
	Location ID												
Analyte	Ambient Air	TLSS002	TLSS002 Duplicate	TLSS016	TLSS019	TLSS005	TLSS015	TLSS022	TLSS023	TLSS014	Not Applicable	EPA Region 9 PRG	CARB Inhalation Value
													Acute / Chronic
Toluene	< 1.2	< 1.2	**3.5**	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	**99**	< 1.0	**400**	37,000 / 300
2-Hexanone	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**NA**	NS / NS
Dibromochloromethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.080**	NS / NS
1,2-Dibromoethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.0034**	NS / 80
Tetrachloroethene	< 1.2	< 1.2	< 1.2	< 1.2	**2.9**	< 1.2	**1.9**	< 6.1	< 1.3	**5.5**	< 1.0	**0.32**	20,000 / 75
Chlorobenzene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**62**	NS / 1,000
Ethylbenzene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	**5.8**	< 1.0	**1,100**	NS / 2,000
m,p-Xylenes	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	**6.6**	< 1.0	**110*** **	22,000 / 700***
Bromoform	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**1.7**	NS / NS
Styrene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	**1.6**	< 1.0	**1,100**	21,000 / 900
o-Xylene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	**2.6**	< 1.0	**110*** **	22,000 / 700***
1,1,2,2-Tetrachloroethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.033**	NS / NS
1,3-Dichlorobenzene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**110**	NS / NS
1,4-Dichlorobenzene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**0.31**	NS / 800
1,2-Dichlorobenzene	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 6.1	< 1.3	< 1.2	< 1.0	**210**	NS / NS

Notes:

All results reported in micrograms per cubic meter.

< 1.2 indicates that the compound was analyzed for, but not detected above the indicated laboratory reporting limit.

Blue shading denotes landfill gas concentration analytical result exceeding US EPA Region 9 PRG for ambient air.
Yellow shading denotes US EPA Region 9 PRG for ambient air that is below the detection limit of one or more samples. For all cases except bromoform, these limits were based on lifetime cancer risk.

* Denotes California modified PRG for cancer risk. EPA's non-cancer PRG value is 520.
** Denotes EPA PRG for this compound. California modified PRG for cancer risk is 0.96.
*** Denotes limit for total concentration of all isomers of the compound.

NS Not Set by CARB in approved risk assessment health values for acute or chronic non-cancer health impacts under the Air Toxics "Hot Spots" Program.

TABLE 5: RESULTS OF LANDFILL GAS SAMPLE ANALYSIS FOR LABORATORY SAMPLES IN PARTS PER BILLION BY VOLUME (ppbV)
Tidal Area Landfill (Site 1), Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Analyte	Sample ID: 0321LFG 001	0321LFG 002	0321LFG 003	0321LFG 004	0321LFG 005	0321LFG 006	0321LFG 007	0321LFG 008	0321LFG 009	0321LFG 010	Method Blank		
	Location ID: Ambient Air	TLSS002	TLSS002 Duplicate	TLSS016	TLSS019	TLSS005	TLSS015	TLSS022	TLSS023	TLSS014	Not Applicable	OSHA PEL 8-HOUR TWA	CARB Inhalation Value Acute	CARB Inhalation Value Chronic
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**100,000**	**NS**	**NS**
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1,000**	**70,472**	**10**
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**20,000(C)**	**875**	**1**
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1,000,000**	**NS**	**11,381**
Acetone	**2.8**	ND	ND	ND	**3.6**	**2.7**	ND	ND	ND	ND	ND	**1,000,000**	**NS**	**NS**
Trichlorofluoromethane (R-11)	ND	**0.25**	**0.22**	ND	ND	ND	ND	ND	ND	ND	ND	**1,000,000**	**NS**	**125**
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**5,000** [(a)]	**NS**	**18**
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1.7**	ND	**12,500**	**4,032**	**115**
Trichlorotrifluoroethane (R-113)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1,000,000**	**NS**	**91**
Carbon Disulfide	ND	ND	**2**	ND	**0.63**	**0.94**	ND	ND	ND	ND	ND	**20,000**	**1,995**	**257**
trans-1,2,-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**200,000***	**NS**	**NS**
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**100,000**	**NS**	**NS**
Methyl tert-Butyl Ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**40,000** [(a)]	**NS**	**222**
Vinyl Acetate	ND	ND	ND	ND	ND	**0.40**	ND	ND	ND	ND	ND	**10,000** [(a)]	**NS**	**57**
2-Butanone (MEK)	ND	ND	ND	ND	ND	**0.52**	ND	ND	ND	**2.8**	ND	**200,000**	**4,415**	**340**
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**200,000***	**NS**	**NS**
Chloroform	ND	ND	ND	ND	ND	**0.33**	ND	ND	ND	**0.43**	ND	**50,000**	**31**	**61**
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**50,000**	**NS**	**99**
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**350,000**	**12,468**	**183**
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1.2**	ND	**10,000**	**408**	**19**
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**10,000**	**302**	**6**
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**75,000**	**NS**	**NS**
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**NE**	**NS**	**NS**
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**100,000**	**NS**	**112**
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**5,000** [(a)*]	**NS**	**NS**
4-Methyl-2-pentanone (MIBK)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**100,000**	**NS**	**NS**
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**5,000** [(a)*]	**NS**	**NS**
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**10,000**	**NS**	**NS**

TABLE 5: RESULTS OF LANDFILL GAS SAMPLE ANALYSIS FOR LABORATORY SAMPLES IN PARTS PER BILLION BY VOLUME (ppbV) (Continued)
Tidal Area Landfill (Site 1), Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Analyte	Sample ID: 0321LFG 001	0321LFG 002	0321LFG 003	0321LFG 004	0321LFG 005	0321LFG 006	0321LFG 007	0321LFG 008	0321LFG 009	0321LFG 010	Method Blank	OSHA PEL	CARB Inhalation Value	
	Location ID: Ambient Air	TLSS002	TLSS002 Duplicate	TLSS016	TLSS019	TLSS005	TLSS015	TLSS022	TLSS023	TLSS014	Not Applicable	8-HOUR TWA	Acute	Chronic
Toluene	ND	ND	**0.93**	ND	ND	ND	ND	ND	ND	**26**	ND	**200,000**	**9,833**	**80**
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**100,000**	**NS**	**NS**
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**NE**	**NS**	**NS**
1,2-Dibromoethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**20,000**	**NS**	**10**
Tetrachloroethene	ND	ND	ND	ND	**0.43**	ND	**0.28**	ND	ND	**0.81**	ND	**100,000**	**3,179**	**12**
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**75,000**	**NS**	**217**
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1.3**	ND	**100,000**	**NS**	**461**
m,p-Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1.5**	ND	**100,000**	**5,075**	**161***
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**500**	**NS**	**NS**
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.38**	ND	**100,000**	**4,937**	**212**
o-Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.60**	ND	**100,000**	**5,075**	**161***
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**5,000**	**NS**	**NS**
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**NE**	**NS**	**NS**
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**75,000**	**NS**	**133**
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**50,000(C)**	**NS**	**NS**

Notes:

All results are reported in parts per billion by volume.

* Denotes limit for total concentration of all isomers of the compound.
(a) No OSHA PEL Limit Set for this compound. Listed value is American Council of Governmental Industrial Hygienists (ACGIH) Recommended TLV Limit.
(C) Ceiling Limit. Ceiling exposures are for short-term periods generally corresponding to no more than 15-minutes and not repeated continuously.
ND Compound was analyzed for, but not detected above the laboratory reporting limit. See Appendix C, Table C-2 for a detailed listing of reporting limits.
NE No exposure limit established by either OSHA or ACGIH for this compound.
NS Not Set by CARB in approved risk assessment health values for acute or chronic non-cancer health impacts under the Air Toxics "Hot Spots" Program.

APPENDIX A
OSHA PERMISSIBLE EXPOSURE LIMITS AND OTHER SCREENING CRITERIA

TABLE A
OSHA PERMISSIBLE EXPOSURE LIMITS AND OTHER SCREENING CRITERIA
TIDAL AREA LANDFILL, SITE 1
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

ANALYTE	CRITERIA EXPRESSED IN MICROGRAMS PER CUBIC METER			CRITERIA EXPRESSED IN PARTS PER BILLION BY VOLUME		
	EPA Region 9 PRG	CARB Inhalation Value		OSHA PEL 8-HOUR TWA	CARB Inhalation Value	
		Acute	Chronic		Acute	Chronic
Chloromethane	95	NS	NS	100,000	NS	NS
Vinyl Chloride	0.11	180,000	26	1,000	70,472	10
Bromomethane	5.2	3,900	5	20,000(C)	875	1
Chloroethane	2.3	NS	30,000	1,000,000.0	NS	11,381
Acetone	3,300	NS	NS	1,000,000	NS	NS
Trichlorofluoromethane (R-11)	730	NS	700	1,000,000	NS	125
1,1-Dichloroethene	210	NS	70	5,000 (a)	NS	18
Methylene chloride	4.1	14,000	400	12,500	4,032	115
Trichlorotrifluoroethane (R-113)	31,000	NS	700	1,000,000	NS	91
Carbon Disulfide	730	6,200	800	20,000	1,995	257
trans-1,2,-Dichloroethene	73	NS	NS	200,000+	NS	NS
1,1-Dichloroethane	1.2*	NS	NS	100,000	NS	NS
Methyl tert-Butyl Ether	7.4	NS	800	40,000 (a)	NS	222
Vinyl Acetate	210	NS	200	10,000 (a)	NS	57
2-Butanone (MEK)	5,100	13,000	1,000	200,000	4,415	340
cis-1,2-Dichloroethene	37	NS	NS	200,000+	NS	NS
Chloroform	0.083	150	300	50,000	31	61
1,2-Dichloroethane	0.074	NS	400	50,000	NS	99
1,1,1-Trichloroethane	2,300	68,000	1,000	350,000	12,468	183
Benzene	0.25	1,300	60	10,000	408	19
Carbon Tetrachloride	0.13	1,900	40	10,000	302	6
1,2-Dichloropropane	0.099	NS	NS	75,000	NS	NS
Bromodichloromethane	0.11	NS	NS	NE	NS	NS
Trichloroethene	0.017**	NS	600	100,000	NS	112
cis-1,3-Dichloropropene	0.48***	NS	NS	5,000 (a)+	NS	NS
4-Methyl-2-pentanone (MIBK)	3,100	NS	NS	100,000	NS	NS
trans-1,3-Dichloropropene	0.48***	NS	NS	5,000 (a)+	NS	NS
1,1,2-Trichloroethane	0.12	NS	NS	10,000	NS	NS
Toluene	400	37,000	300	200,000	9,833	80
2-Hexanone	NA	NS	NS	100,000	NS	NS
Dibromochloromethane	0.080	NS	NS	NE	NS	NS
1,2-Dibromoethane	0.0034	NS	80	20,000	NS	10
Tetrachloroethene	0.32	20,000	75	100,000	3,179	12
Chlorobenzene	62	NS	1,000	75,000	NS	217
Ethylbenzene	1,100	NS	2,000	100,000	NS	461
m,p -Xylenes	110***	22,000	700***	100,000	5,075	161 +
Bromoform	1.7	NS	NS	500	NS	NS
Styrene	1,100	21,000	900	100,000	4,937	212
o-Xylene	110***	22,000	700***	100,000	5,075	161 +
1,1,2,2-Tetrachloroethane	0.033	NS	NS	5,000	NS	NS
1,3-Dichlorobenzene	110	NS	NS	NE	NS	NS
1,4-Dichlorobenzene	0.31	NS	800	75,000	NS	133
1,2-Dichlorobenzene	210	NS	NS	50,000(C)	NS	NS

Notes:

NA = Not Available, no EPA Region 9 PRG has been published.

NS = Not Set by CARB in Table 1 listing approved risk assessment health values for acute or chronic non-cancer health impacts under the Air Toxics "Hot Spots" Program.

* denotes California modified PRG for cancer risk. EPA's non-cancer PRG value is 520.

** denotes EPA PRG for this compound. California modified PRG for cancer risk is 0.96.

*** denotes limit for total concentration of all isomers of the compound

(C) = Ceiling Limit. Ceiling exposures are for short-term periods generally corresponding to no more than 15-minutes and not repeated continuously.

(a) = No OSHA PEL Limit Set for this compound. Listed value is ACGIH Recommended TLV Limit.

NE = No exposure limit established by either OSHA or ACGIH for this compound.

NS = Not Set by CARB in Table 1 listing approved risk assessment health values for acute or chronic non-cancer health impacts under the Air Toxics "Hot Spots" Program.

+ denotes limit for total concentration of all isomers of the compound

APPENDIX B
FIELD FORMS

Tetra Tech EM Inc.
San Francisco Office

135 Main St. Suite 1800
San Francisco. CA 94105
415-543-4880
Fax 415-543-5480

Chain of Custody Record No. 6334

Project name: NWS SBD Concord Site 1 LFG Survey	**Lab PO#:** 05SF01	**Lab:** Columbia Analytical Services, Inc.
Project (CTO) number: G1058-11010320 02	**TtEMI technical contact:** Sara Woolley & Kevin Hoch	**Field samplers:** Richard Vermeen, James Medley
	TtEMI project manager: John Bosche	**Field samplers' signatures:** Richard Vermeen

Preservative Added: NA

No./Container Types: 40 ml VOA; 1 liter Amber; 500 ml Poly; Sleeve; Glass Jar; Summa Canister; MS / MSD

Analysis Required: VOA; SVOA; Pest/PCBs; Metals; TPH Purgeables; TPH Extractables; EPA 3C M (ASTM D1946); EPA TO-15; EPA TO-3M

Sample ID	Sample Location (Pt. ID)	Date	Time	Matrix	Summa Canister	EPA 3C M (ASTM D1946)	EPA TO-15	EPA TO-3M
0321LFG001	ambient air blank w/tubing	2-2-05	1335	soil gas	1	X	X	X
0321LFG002	0321TLSS002		1400		1	X	X	X
0321LFG003	0321TLSS002 (duplicate)		1405		1	X	X	X
0321LFG004	0321TLSS016		1420		1	X	X	X
0321LFG005	0321TLSS019		1430		1	X	X	X
0321LFG006	0321TL6S005		1440		1	X	X	X
0321LFG007	0321TLSS015		1450		1	X	X	X
0321LFG008	0321TLSS022		1505		1	X	X	X
0321LFG009	0321TLSS023		1510		1	X	X	X
0321LFG010	0321TLSS014		1520		1	X	X	X

	Name (print)	Company Name	Date	Time
Relinquished by: Richard J Vermeen	Richard Vermeen	Tetra Tech EM Inc.	2-2-05	1540
Received by:				
Relinquished by:				
Received by:				
Relinquished by:				
Received by:				

Turnaround time/remarks:

*all Summas at ambient pressure

Fed Ex #: 8482 5590 6343 (3 boxes)

WHITE-Laboratory Copy YELLOW-Sample Tracker PINK-File Copy

NWS SDD, Concord

Site 1 Landfill Gas Survey

Weather: Sunny, temp in mid-60s, NE breeze 5-10mph

Name: Richard Vernimen, James Medley

Date: Feb. 2, 2005

Monitoring Log

Sampling Location		Time	Barometric Pressure (in Hg)*	LFG					Notes: ie. probe damage, instrument issues.
Location ID	~~Location Description~~ Notes			Methane ppm	CO2 %	O2 %	LEL (%)	Hydrogen Sulfide (ppm)	
0321TLSS0001		1003	30.27 stable	40.0	0.0	20.8	0	0.0	
0002	✓Summa sample	1000		1000.0	0.0	20.8	0	0.0	1400 0321LFG0002 & -0003(dup) 1405
0003		1006		0.0	0.0	20.8	0	0.0	
4		0956		1000.0	0.0	20.8	0	0.0	
5	✓Summa sample	0945		80.0	0.0	20.8	0	0.0	0321LFG0006 @ 1440
6		0947		410.0	0.0	20.8	0	0.0	
7		0950		40.0	0.0	20.9	0	0.0	
8		0940		60.0	0.0	20.7	0	0.0	
9		0930		0.0	0.0	20.9	0	0.0	
10		0935		0.0	0.0	20.9	0	0.0	
11		1205		0.0	0.0	20.9	0	0.0	
12		1202		0.0	0.0	20.9	0	0.0	
13		1159		0.0	0.0	20.9	0	0.0	
14	✓Summa sample	1207		80.0	0.0	20.9	0	0.0	0321LFG0010 @ 1520
15	✓Summa sample	1211		40.0	0.0	20.9	0	0.0	0321LFG0007 @ 1450
16	✓Summa sample	1214		0.0	0.0	20.9	0	0.0	0321LFG0004 @ 1420
17		1218		0.0	0.0	20.9	0	0.0	
18		1221		0.0	0.0	20.9	0	0.0	in hole
19	✓Summa sample	1228		80.0	0.0	20.9	0	0.0	0321LFG0005 @ 1430
20		1232		0.0	0.0	20.9	0	0.0	
21		1236		0.0	0.0	20.9	0	0.0	
22	✓Summa sample	1300		160.0	0.0	20.9	0	0.0	0321LFG0008 @ 1505
23	✓Summa sample	1303		240.0	0.0	20.9	0	0.0	0321LFG0009 @ 1510
24		1306		80.0	0.0	20.9	0	0.0	
25		1309		60.0	0.0	20.9	0	0.0	
26		1256	✓	180.0	0.0	20.9	0	0.0	

Notes:
LFG = Landfill Gas

*Barometric pressure @ 0700 2/2/05 at Buchanan Field Airport, Concord, CA

NWS SBD, Concord
Site 1 Landfill Gas Survey

Weather: Sunny, temp. in mid-60s, NE breeze 5-10 mph

Name: Richard Vernimen, James Medley
Date: Feb. 2, 2005

Monitoring Log

Sampling Location		Time	Barometric Pressure (in Hg)	LFG					Notes: ie. probe damage, instrument issues.
Location ID	Location Description			Methane ppm	CO2 %	O2 %	LEL (%)	Hydrogen Sulfide (ppm)	
0321TLSS 27		1240	30.27	100.0	0.0	20.9	0	0.0	
" 28		1246	↓	0.0	0.0	20.9	0	0.0	
" 29		1250		40.0	0.0	20.9	0	0.0	
" 30		1253		40.0	0.0	20.9	0	0.0	
GMP3		1313		180.0	0.0	20.9	0	0.0	location w/in 15' of wetland area
GMP2		1320		180.0	0.0	20.9	0	0.0	
GMP1		1325	↓	280.0	0.0	20.9	0	0.0	

Notes:
LFG = Landfill Gas

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Calibration and Components Checklist
GT-Series

GT-201	**Instrument ID #** _____	**LEL/O2**
GT-202	**Instrument ID #** _____	**LEL/O2**
GT-302	**Instrument ID #** _____	**LEL/O2/H2S**
GT-402	**Instrument ID #** _____	**LEL/O2/H2S/CO**
GT-408	**Instrument ID #** 617	**LEL/O2/CO/CO2**
Land Surveyor Instrument ID # _____		**Methane/LEL/O2/CO**

Components

Date Out: 01/31/05 **Date In:** _____

Meter: X	_____	**Meter**
Probe: X	_____	**Probe**
Charger: _____	_____	**Charger**
Manual: X	_____	**Manual**
Case: X	_____	**Case**
Calibration Sheet: X	_____	**Calibration Sheet**
Terms & Conditions: Y	_____	**Terms & Conditions**

Calibration Gases Used

50% LEL Methane ___	_____	**Meter Response**
40% LEL Hexane _____	_____	**Meter Response**
100 ppm CO X	100PPM	**Meter Response**
25 ppm H2S _____	_____	**Meter Response**
Nitrogen X	0.0%	**Meter Response**
2.5% CO2 X	2.5%	**Meter Response**
Other Gases Used _____	_____	**Meter Response**

Battery Charged _____ **Yes** _____ **No**
Extra Batteries X **Yes** _____ **No**

Inspected & Calibrated By: _____ **Date:** 01/31/05

Note: This unit has been tested and is in proper working condition. This unit has been cleaned and should be returned in the same condition. Any components missing upon return of this instrument shall be billed at the current price. If the unit is returned overly dirty or damaged a service order will be issued and your account will be billed. Should the unit malfunction you must notify EILCO within 24 hours or you will be billed for the time the unit was in your possession.

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Phone 800/648-9355
Fax 925/686-4608

EILCO

Environmental Instruments Leasing Company 1-800-648-9355

Calibration and Components Checklist
GT-Series

GT-201	**Instrument ID #** _____	**LEL/O2**
GT-202	**Instrument ID #** _____	**LEL/O2**
GT-302	**Instrument ID #** _____	**LEL/O2/H2S**
GT-402	**Instrument ID #** 743	**LEL/O2/H2S/CO**
GT-408	**Instrument ID #** _____	**LEL/O2/CO/CO2**
Land Surveyor Instrument ID # _____		**Methane/LEL/O2/CO**

Components

Date Out: 01/31/05 **Date In:** _____

Meter:	X	_____	**Meter**
Probe:	X	_____	**Probe**
Charger:	_____	_____	**Charger**
Manual:	X	_____	**Manual**
Case:	X	_____	**Case**
Calibration Sheet:	X	_____	**Calibration Sheet**
Terms & Conditions:	X	_____	**Terms & Conditions**

Calibration Gases Used

50% LEL Methane	_____	_____	**Meter Response**
40% LEL Hexane	_____	_____	**Meter Response**
100 ppm CO	_____	_____	**Meter Response**
25 ppm H2S	X	25 PPm	**Meter Response**
Nitrogen	X	0.0%	**Meter Response**
2.5% CO2	_____	_____	**Meter Response**
Other Gases Used	_____	_____	**Meter Response**

Battery Charged _____ **Yes** _____ **No**
Extra Batteries X **Yes** _____ **No**

Inspected & Calibrated By: _____ **Date:** 01/31/05

Note: This unit has been tested and is in proper working condition. This unit has been cleaned and should be returned in the same condition. Any components missing upon return of this instrument shall be billed at the current price. If the unit is returned overly dirty or damaged a service order will be issued and your account will be billed. Should the unit malfunction you must notify EILCO within 24 hours or you will be billed for the time the unit was in your possession.

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Calibration and Components Checklist
GT-Series

GT-201	Instrument ID # _____	LEL/O2
GT-202	Instrument ID # _____	LEL/O2
GT-302	Instrument ID # _____	LEL/O2/H2S
GT-402	Instrument ID # _____	LEL/O2/H2S/CO
GT-408	Instrument ID # _____	LEL/O2/CO/CO2
Land Surveyor	Instrument ID # 610	Methane/LEL/O2/CO

Components

Date Out: 01/31/05 Date In: _____

Meter:	X	_____ Meter
Probe:	X	_____ Probe
Charger:	_____	_____ Charger
Manual:	X	_____ Manual
Case:	X	_____ Case
Calibration Sheet:	X	_____ Calibration Sheet
Terms & Conditions:	X	_____ Terms & Conditions

Calibration Gases Used

50% LEL Methane	X	_____ Meter Response
40% LEL Hexane	_____	_____ Meter Response
100 ppm CO	_____	_____ Meter Response
25 ppm H2S	_____	_____ Meter Response
Nitrogen	X	_____ Meter Response
2.5% CO2	_____	_____ Meter Response
Other Gases Used	_____	_____ Meter Response

Battery Charged _____ Yes _____ No
Extra Batteries X Yes _____ No

Inspected & Calibrated By: MM Date: 01/31/05

Note: This unit has been tested and is in proper working condition. This unit has been cleaned and should be returned in the same condition. Any components missing upon return of this instrument shall be billed at the current price. If the unit is returned overly dirty or damaged a service order will be issued and your account will be billed. Should the unit malfunction you must notify EILCO within 24 hours or you will be billed for the time the unit was in your possession.

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APPENDIX C
ANALTYICAL DATA

Appendix C-1
Analytical Laboratory Landfill Gas Sampling Results
Site 1 Tidal Area Landfill
Naval Weapons Station Seal Beach Detachment Concord

Point ID	**0321TLSS002**	**0321TLSS002**	**0321TLSS005**	**0321TLSS014**	**0321TLSS015**	**0321TLSS016**	**0321TLSS019**
Sample ID	0321LFG002	0321LFG003	0321LFG006	0321LFG010	0321LFG007	0321LFG004	0321LFG005
Matrix	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS
Sample Date	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005
Sample Depth (in feet)	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
EPA Method TO15 (in ug/m3)							
1,1,1-TRICHLOROETHANE	1.2201149 U	1.2201149 U	1.2755747 U	1.2201149 U	1.2755747 U	1.2755747 U	1.2755747 U
1,1,2,2-TETRACHLOROETHANE	1.2560306 U	1.2560306 U	1.2560306 U	1.2560306 U	1.2560306 U	1.2560306 U	1.2560306 U
1,1,2-TRICHLOROETHANE	1.2201149 U	1.2201149 U	1.2755747 U	1.2201149 U	1.2755747 U	1.2755747 U	1.2755747 U
1,1-DICHLOROETHANE	1.2342015 U	1.2342015 U	1.2753416 U	1.2342015 U	1.2342015 U	1.2753416 U	1.2342015 U
1,1-DICHLOROETHENE	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U
1,2-DIBROMOETHANE	1.2495824 U	1.2495824 U	1.2495824 U	1.2495824 U	1.2495824 U	1.2495824 U	1.2495824 U
1,2-DICHLOROBENZENE	1.2222636 U	1.2222636 U	1.2833768 U	1.2222636 U	1.2222636 U	1.2833768 U	1.2222636 U
1,2-DICHLOROETHANE	1.234203 U	1.234203 U	1.2753431 U	1.234203 U	1.234203 U	1.2753431 U	1.234203 U
1,2-DICHLOROPROPANE	1.2212551 U	1.2212551 U	1.2682265 U	1.2212551 U	1.2682265 U	1.2682265 U	1.2682265 U
1,3-DICHLOROBENZENE	1.2222636 U	1.2222636 U	1.2833768 U	1.2222636 U	1.2222636 U	1.2833768 U	1.2222636 U
1,4-DICHLOROBENZENE	1.2222636 U	1.2222636 U	1.2833768 U	1.2222636 U	1.2222636 U	1.2833768 U	1.2222636 U
2-BUTANONE	1.2290394 U	1.2290394 U	1.5587816	8.3934396	1.2590159 U	1.2590159 U	1.2590159 U
2-HEXANONE	1.2491751 U	1.2491751 U	1.2491751 U	1.2491751 U	1.2491751 U	1.2491751 U	1.2491751 U
4-METHYL-2-PENTANONE	1.2491751 U	1.2491751 U	1.2491751 U	1.2491751 U	1.2491751 U	1.2491751 U	1.2491751 U
ACETONE	6.0363175 U	6.0363175 U	6.5192229	6.0363175 U	6.2777702 U	6.2777702 U	8.6922972
BENZENE	1.2340025 U	1.2340025 U	1.2664763 U	3.89685	1.2664763 U	1.2664763 U	1.2664763 U
BROMODICHLOROMETHANE	1.225942 U	1.225942 U	1.2940499 U	1.225942 U	1.225942 U	1.2940499 U	1.225942 U
BROMOFORM	1.2608009 U	1.2608009 U	1.2608009 U	1.2608009 U	1.2608009 U	1.2608009 U	1.2608009 U
BROMOMETHANE	1.2235223 U	1.2235223 U	1.2629907 U	1.2235223 U	1.2629907 U	1.2629907 U	1.2629907 U
CARBON DISULFIDE	1.2343352 U	6.329924	2.9750643	1.2343352 U	1.2659848 U	1.2659848 U	1.9939261
CARBON TETRACHLORIDE	1.2150154 U	1.2150154 U	1.2789636 U	1.2150154 U	1.2789636 U	1.2789636 U	1.2789636 U
CHLOROBENZENE	1.2166302 U	1.2166302 U	1.2634237 U	1.2166302 U	1.2634237 U	1.2634237 U	1.2634237 U
CHLOROETHANE	1.2337356 U	1.2337356 U	1.260556 U	1.2337356 U	1.260556 U	1.260556 U	1.260556 U
CHLOROFORM	1.2407118 U	1.2407118 U	1.6377395	2.1340242	1.2407118 U	1.2407118 U	1.2407118 U
CHLOROMETHANE	1.2383534 U	1.2383534 U	1.2593424 U	1.2383534 U	1.2593424 U	1.2593424 U	1.2593424 U
CIS-1,2-DICHLOROETHENE	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U
CIS-1,3-DICHLOROPROPENE	1.2455999 U	1.2455999 U	1.2455999 U	1.2455999 U	1.2455999 U	1.2455999 U	1.2455999 U
DIBROMOCHLOROMETHANE	1.2122225 U	1.2122225 U	1.2988098 U	1.2122225 U	1.2122225 U	1.2988098 U	1.2122225 U
ETHYLBENZENE	1.2358178 U	1.2358178 U	1.2799542 U	5.7377255	1.2358178 U	1.2799542 U	1.2358178 U
FREON 113	1.2463538 U	1.2463538 U	1.2463538 U	1.2463538 U	1.2463538 U	1.2463538 U	1.2463538 U
M,P-XYLENE	1.2359693 U	1.2359693 U	1.280111 U	6.621264	1.2359693 U	1.280111 U	1.2359693 U

Appendix C-1 (Continued)
Analytical Laboratory Landfill Gas Sampling Results
Site 1 Tidal Area Landfill
Naval Weapons Station Seal Beach Detachment Concord

Point ID	**0321TLSS002**	**0321TLSS002**	**0321TLSS005**	**0321TLSS014**	**0321TLSS015**	**0321TLSS016**	**0321TLSS019**
Sample ID	0321LFG002	0321LFG003	0321LFG006	0321LFG010	0321LFG007	0321LFG004	0321LFG005
Matrix	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS
Sample Date	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005
Sample Depth (in feet)	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
EPA Method TO15 (in ug/m3)							
METHYL TERTIARY BUTYL ETHER	1.2459603 U	1.2459603 U	1.2459603 U	1.2459603 U	1.2459603 U	1.2459603 U	1.2459603 U
METHYLENE CHLORIDE	1.2358063 U	1.2358063 U	1.271115 U	6.0024875	1.2358063 U	1.271115 U	1.2358063 U
O-XYLENE	1.2358178 U	1.2358178 U	1.2799542 U	2.648181	1.2358178 U	1.2799542 U	1.2358178 U
STYRENE	1.2123532 U	1.2123532 U	1.2556516 U	1.6453365	1.2556516 U	1.2556516 U	1.2556516 U
TETRACHLOROETHENE	1.2409463 U	1.2409463 U	1.2409463 U	5.5842583	1.9303609	1.2409463 U	2.9644828
TOLUENE	1.2257616 U	3.5623697	1.2640667 U	99.59313	1.2640667 U	1.2640667 U	1.2640667 U
TRANS-1,2-DICHLOROETHENE	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U	1.2493629 U
TRANS-1,3-DICHLOROPROPENE	1.2455999 U	1.2455999 U	1.2455999 U	1.2455999 U	1.2455999 U	1.2455999 U	1.2455999 U
TRICHLOROETHENE	1.2563003 U	1.2563003 U	1.2563003 U	1.2563003 U	1.2563003 U	1.2563003 U	1.2563003 U
TRICHLOROFLUOROMETHANE	1.4276895	1.2563668	1.2563668 U	1.2563668 U	1.2563668 U	1.2563668 U	1.2563668 U
VINYL ACETATE	1.2168569 U	1.2168569 U	1.4315964	1.2168569 U	1.2526469 U	1.2526469 U	1.2526469 U
VINYL CHLORIDE	1.221169 U	1.221169 U	1.2731337 U	1.221169 U	1.2471514 U	1.2731337 U	1.2471514 U
EPA Method TO3 (in ppbv)							
C6+ AS N-HEXANE	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
ETHANE	.6 U	.61 U	.62 U	.61 U	.61 U	.62 U	.61 U
METHANE	2.5	3.1	3	2.5	2.9	3.2	2.9
N-BUTANE	.6 U	.61 U	.62 U	.61 U	.61 U	.62 U	.61 U
N-HEXANE	.6 U	.61 U	.62 U	.61 U	.61 U	.62 U	.61 U
N-PENTANE	.6 U	.61 U	.62 U	.61 U	.61 U	.62 U	.61 U
N-PROPANE	.6 U	.61 U	.62 U	.61 U	.61 U	.62 U	.61 U
EPA Method 3C (in %V/V)							
CARBON DIOXIDE	.378	.125	.188	.187	.123 U	.124 U	.3
NITROGEN	77.5	77.5	77.4	77.4	77.5	77.5	77.6
OXYGEN	22.1	22.4	22.4	22.4	22.4	22.4	22.1

Appendix C-1 (Continued)
Analytical Laboratory Landfill Gas Sampling Results
Site 1 Tidal Area Landfill
Naval Weapons Station Seal Beach Detachment Concord

Point ID	**0321TLSS022**	**0321TLSS023**	**AMBIENT AIR BLA**
Sample ID	0321LFG008	0321LFG009	0321LFG001
Matrix	SOIL GAS	SOIL GAS	SOIL GAS
Sample Date	02/02/2005	02/02/2005	02/02/2005
Sample Depth (in feet)	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
EPA Method TO15 (in ug/m3)			
1,1,1-TRICHLOROETHANE	6.1005747 U	1.2755747 U	1.2201149 U
1,1,2,2-TETRACHLOROETHANE	6.2103737 U	1.2560306 U	1.2560306 U
1,1,2-TRICHLOROETHANE	6.1005747 U	1.2755747 U	1.2201149 U
1,1-DICHLOROETHANE	6.1710075 U	1.2753416 U	1.2342015 U
1,1-DICHLOROETHENE	6.0453045 U	1.289665 U	1.2493629 U
1,2-DIBROMOETHANE	6.1698131 U	1.2495824 U	1.2495824 U
1,2-DICHLOROBENZENE	6.111318 U	1.2833768 U	1.2222636 U
1,2-DICHLOROETHANE	6.171015 U	1.2753431 U	1.234203 U
1,2-DICHLOROPROPANE	6.1062755 U	1.2682265 U	1.2212551 U
1,3-DICHLOROBENZENE	6.111318 U	1.2833768 U	1.2222636 U
1,4-DICHLOROBENZENE	6.111318 U	1.2833768 U	1.2222636 U
2-BUTANONE	6.2950797 U	1.2590159 U	1.2290394 U
2-HEXANONE	6.2458755 U	1.2908143 U	1.2491751 U
4-METHYL-2-PENTANONE	6.2458755 U	1.2908143 U	1.2491751 U
ACETONE	31.388851 U	6.2777702 U	6.7606756
BENZENE	6.1700125 U	1.2664763 U	1.2340025 U
BROMODICHLOROMETHANE	6.197818 U	1.2940499 U	1.225942 U
BROMOFORM	6.1989377 U	1.2608009 U	1.2608009 U
BROMOMETHANE	6.3149536 U	1.2629907 U	1.2235223 U
CARBON DISULFIDE	6.329924 U	1.2659848 U	1.2343352 U
CARBON TETRACHLORIDE	6.2029735 U	1.2789636 U	1.2150154 U
CHLOROBENZENE	6.0831511 U	1.2634237 U	1.2634237 U
CHLOROETHANE	6.1686782 U	1.260556 U	1.2337356 U
CHLOROFORM	5.9554164 U	1.2903402 U	1.2407118 U
CHLOROMETHANE	6.296712 U	1.2803314 U	1.2383534 U
CIS-1,2-DICHLOROETHENE	6.0453045 U	1.289665 U	1.2493629 U
CIS-1,3-DICHLOROPROPENE	5.9973329 U	1.2917332 U	1.2455999 U
DIBROMOCHLOROMETHANE	6.234287 U	1.2988098 U	1.2122225 U
ETHYLBENZENE	6.179089 U	1.2799542 U	1.2358178 U
FREON 113	6.2317688 U	1.2463538 U	1.2463538 U
M,P-XYLENE	6.1798464 U	1.280111 U	1.2359693 U

Appendix C-1 (Continued)
Analytical Laboratory Landfill Gas Sampling Results
Site 1 Tidal Area Landfill
Naval Weapons Station Seal Beach Detachment Concord

Point ID	**0321TLSS022**	**0321TLSS023**	**AMBIENT AIR BLA**
Sample ID	0321LFG008	0321LFG009	0321LFG001
Matrix	SOIL GAS	SOIL GAS	SOIL GAS
Sample Date	02/02/2005	02/02/2005	02/02/2005
Sample Depth (in feet)	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
EPA Method TO15 (in ug/m3)			
METHYL TERTIARY BUTYL ETHER	6.2298013 U	1.2826062 U	1.2459603 U
METHYLENE CHLORIDE	6.355575 U	1.271115 U	1.2358063 U
O-XYLENE	6.179089 U	1.2799542 U	1.2358178 U
STYRENE	6.0617662 U	1.2556516 U	1.2556516 U
TETRACHLOROETHENE	6.2047314 U	1.2409463 U	1.2409463 U
TOLUENE	6.128808 U	1.2640667 U	1.2257616 U
TRANS-1,2-DICHLOROETHENE	6.0453045 U	1.289665 U	1.2493629 U
TRANS-1,3-DICHLOROPROPENE	5.9973329 U	1.2917332 U	1.2455999 U
TRICHLOROETHENE	6.0083925 U	1.2563003 U	1.2563003 U
TRICHLOROFLUOROMETHANE	6.2818338 U	1.2563668 U	1.2563668 U
VINYL ACETATE	6.0842847 U	1.2884368 U	1.2526469 U
VINYL CHLORIDE	6.2357568 U	1.2731337 U	1.2471514 U
EPA Method TO3 (in ppbv)			
C6+ AS N-HEXANE	3.6	1.2 U	1.2 U
ETHANE	.61 U	.62 U	.61 U
METHANE	2.8	2.5	3
N-BUTANE	.61 U	.62 U	.61 U
N-HEXANE	.61 U	.62 U	.61 U
N-PENTANE	.61 U	.62 U	.61 U
N-PROPANE	.61 U	.62 U	.61 U
EPA Method 3C (in %V/V)			
CARBON DIOXIDE	.198	.177	.122 U
NITROGEN	77.4	77.4	77.5
OXYGEN	22.4	22.4	22.5

Appendix C-1 (Continued)
Analytical Laboratory Landfill Gas Sampling Results
Site 1 Tidal Area Landfill
Naval Weapons Station Seal Beach Detachment Concord

Notes:

	Inorganic results less than 10 are reported to two significant figures and results greater than 10 are reported to three significant figures.
	Organic results less than 10 are reported to one significant figure and results greater than 10 are reported to two significant figures.
J	Estimated value
U	Not detected with detection limit indicated
ppbv	Parts per billion volume
µg/m3	Microgram per cubic meter

Appendix C-2
Analytical Laboratory Landfill Gas Sampling Results
Site 1 Tidal Area Landfill
Naval Weapons Station Seal Beach Detachment Concord

Point ID	**0321TLSS002**	**0321TLSS002**	**0321TLSS005**	**0321TLSS014**	**0321TLSS015**	**0321TLSS016**	**0321TLSS019**
Sample ID	0321LFG002	0321LFG003	0321LFG006	0321LFG010	0321LFG007	0321LFG004	0321LFG005
Matrix	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS
Sample Date	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005
Sample Depth (in feet)	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
EPA Method TO15 (in ppbv)							
1,1,1-TRICHLOROETHANE	.22 U	.22 U	.23 U	.22 U	.23 U	.23 U	.23 U
1,1,2,2-TETRACHLOROETHANE	.18 U	.18 U	.18 U	.18 U	.18 U	.18 U	.18 U
1,1,2-TRICHLOROETHANE	.22 U	.22 U	.23 U	.22 U	.23 U	.23 U	.23 U
1,1-DICHLOROETHANE	.3 U	.3 U	.31 U	.3 U	.3 U	.31 U	.3 U
1,1-DICHLOROETHENE	.31 U	.31 U	.31 U	.31 U	.31 U	.31 U	.31 U
1,2-DIBROMOETHANE	.16 U	.16 U	.16 U	.16 U	.16 U	.16 U	.16 U
1,2-DICHLOROBENZENE	.2 U	.2 U	.21 U	.2 U	.2 U	.21 U	.2 U
1,2-DICHLOROETHANE	.3 U	.3 U	.31 U	.3 U	.3 U	.31 U	.3 U
1,2-DICHLOROPROPANE	.26 U	.26 U	.27 U	.26 U	.27 U	.27 U	.27 U
1,3-DICHLOROBENZENE	.2 U	.2 U	.21 U	.2 U	.2 U	.21 U	.2 U
1,4-DICHLOROBENZENE	.2 U	.2 U	.21 U	.2 U	.2 U	.21 U	.2 U
2-BUTANONE	.41 U	.41 U	.52	2.8	.42 U	.42 U	.42 U
2-HEXANONE	.3 U	.3 U	.3 U	.3 U	.3 U	.3 U	.3 U
4-METHYL-2-PENTANONE	.3 U	.3 U	.3 U	.3 U	.3 U	.3 U	.3 U
ACETONE	2.5 U	2.5 U	2.7	2.5 U	2.6 U	2.6 U	3.6
BENZENE	.38 U	.38 U	.39 U	1.2	.39 U	.39 U	.39 U
BROMODICHLOROMETHANE	.18 U	.18 U	.19 U	.18 U	.18 U	.19 U	.18 U
BROMOFORM	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U	.12 U
BROMOMETHANE	.31 U	.31 U	.32 U	.31 U	.32 U	.32 U	.32 U
CARBON DISULFIDE	.39 U	2	.94	.39 U	.4 U	.4 U	.63
CARBON TETRACHLORIDE	.19 U	.19 U	.2 U	.19 U	.2 U	.2 U	.2 U
CHLOROBENZENE	.26 U	.26 U	.27 U	.26 U	.27 U	.27 U	.27 U
CHLOROETHANE	.46 U	.46 U	.47 U	.46 U	.47 U	.47 U	.47 U
CHLOROFORM	.25 U	.25 U	.33	.43	.25 U	.25 U	.25 U
CHLOROMETHANE	.59 U	.59 U	.6 U	.59 U	.6 U	.6 U	.6 U
CIS-1,2-DICHLOROETHENE	.31 U	.31 U	.31 U	.31 U	.31 U	.31 U	.31 U
CIS-1,3-DICHLOROPROPENE	.27 U	.27 U	.27 U	.27 U	.27 U	.27 U	.27 U
DIBROMOCHLOROMETHANE	.14 U	.14 U	.15 U	.14 U	.14 U	.15 U	.14 U
ETHYLBENZENE	.28 U	.28 U	.29 U	1.3	.28 U	.29 U	.28 U
FREON 113	.16 U	.16 U	.16 U	.16 U	.16 U	.16 U	.16 U
M,P-XYLENE	.28 U	.28 U	.29 U	1.5	.28 U	.29 U	.28 U

Appendix C-2 (Continued)
Analytical Laboratory Landfill Gas Sampling Results
Site 1 Tidal Area Landfill
Naval Weapons Station Seal Beach Detachment Concord

Point ID	**0321TLSS002**	**0321TLSS002**	**0321TLSS005**	**0321TLSS014**	**0321TLSS015**	**0321TLSS016**	**0321TLSS019**
Sample ID	0321LFG002	0321LFG003	0321LFG006	0321LFG010	0321LFG007	0321LFG004	0321LFG005
Matrix	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS	SOIL GAS
Sample Date	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005	02/02/2005
Sample Depth (in feet)	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
EPA Method TO15 (in ppbv)							
METHYL TERTIARY BUTYL ETHER	.34 U	.34 U	.34 U	.34 U	.34 U	.34 U	.34 U
METHYLENE CHLORIDE	.35 U	.35 U	.36 U	1.7	.35 U	.36 U	.35 U
O-XYLENE	.28 U	.28 U	.29 U	.6	.28 U	.29 U	.28 U
STYRENE	.28 U	.28 U	.29 U	.38	.29 U	.29 U	.29 U
TETRACHLOROETHENE	.18 U	.18 U	.18 U	.81	.28	.18 U	.43
TOLUENE	.32 U	.93	.33 U	26	.33 U	.33 U	.33 U
TRANS-1,2-DICHLOROETHENE	.31 U	.31 U	.31 U	.31 U	.31 U	.31 U	.31 U
TRANS-1,3-DICHLOROPROPENE	.27 U	.27 U	.27 U	.27 U	.27 U	.27 U	.27 U
TRICHLOROETHENE	.23 U	.23 U	.23 U	.23 U	.23 U	.23 U	.23 U
TRICHLOROFLUOROMETHANE	.25	.22	.22 U	.22 U	.22 U	.22 U	.22 U
VINYL ACETATE	.34 U	.34 U	.4	.34 U	.35 U	.35 U	.35 U
VINYL CHLORIDE	.47 U	.47 U	.49 U	.47 U	.48 U	.49 U	.48 U
EPA Method TO3 (in ppbv)							
C6+ AS N-HEXANE	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
ETHANE	.6 U	.61 U	.62 U	.61 U	.61 U	.62 U	.61 U
METHANE	2.5	3.1	3	2.5	2.9	3.2	2.9
N-BUTANE	.6 U	.61 U	.62 U	.61 U	.61 U	.62 U	.61 U
N-HEXANE	.6 U	.61 U	.62 U	.61 U	.61 U	.62 U	.61 U
N-PENTANE	.6 U	.61 U	.62 U	.61 U	.61 U	.62 U	.61 U
N-PROPANE	.6 U	.61 U	.62 U	.61 U	.61 U	.62 U	.61 U
EPA Method 3C (in %V/V)							
CARBON DIOXIDE	.378	.125	.188	.187	.123 U	.124 U	.3
NITROGEN	77.5	77.5	77.4	77.4	77.5	77.5	77.6
OXYGEN	22.1	22.4	22.4	22.4	22.4	22.4	22.1

Appendix C-2 (Continued)
Analytical Laboratory Landfill Gas Sampling Results
Site 1 Tidal Area Landfill
Naval Weapons Station Seal Beach Detachment Concord

Point ID	**0321TLSS022**	**0321TLSS023**	**AMBIENT AIR BLA**
Sample ID	0321LFG008	0321LFG009	0321LFG001
Matrix	SOIL GAS	SOIL GAS	SOIL GAS
Sample Date	02/02/2005	02/02/2005	02/02/2005
Sample Depth (in feet)	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
EPA Method TO15 (in ppbv)			
1,1,1-TRICHLOROETHANE	1.1 U	.23 U	.22 U
1,1,2,2-TETRACHLOROETHANE	.89 U	.18 U	.18 U
1,1,2-TRICHLOROETHANE	1.1 U	.23 U	.22 U
1,1-DICHLOROETHANE	1.5 U	.31 U	.3 U
1,1-DICHLOROETHENE	1.5 U	.32 U	.31 U
1,2-DIBROMOETHANE	.79 U	.16 U	.16 U
1,2-DICHLOROBENZENE	1 U	.21 U	.2 U
1,2-DICHLOROETHANE	1.5 U	.31 U	.3 U
1,2-DICHLOROPROPANE	1.3 U	.27 U	.26 U
1,3-DICHLOROBENZENE	1 U	.21 U	.2 U
1,4-DICHLOROBENZENE	1 U	.21 U	.2 U
2-BUTANONE	2.1 U	.42 U	.41 U
2-HEXANONE	1.5 U	.31 U	.3 U
4-METHYL-2-PENTANONE	1.5 U	.31 U	.3 U
ACETONE	13 U	2.6 U	2.8
BENZENE	1.9 U	.39 U	.38 U
BROMODICHLOROMETHANE	.91 U	.19 U	.18 U
BROMOFORM	.59 U	.12 U	.12 U
BROMOMETHANE	1.6 U	.32 U	.31 U
CARBON DISULFIDE	2 U	.4 U	.39 U
CARBON TETRACHLORIDE	.97 U	.2 U	.19 U
CHLOROBENZENE	1.3 U	.27 U	.27 U
CHLOROETHANE	2.3 U	.47 U	.46 U
CHLOROFORM	1.2 U	.26 U	.25 U
CHLOROMETHANE	3 U	.61 U	.59 U
CIS-1,2-DICHLOROETHENE	1.5 U	.32 U	.31 U
CIS-1,3-DICHLOROPROPENE	1.3 U	.28 U	.27 U
DIBROMOCHLOROMETHANE	.72 U	.15 U	.14 U
ETHYLBENZENE	1.4 U	.29 U	.28 U
FREON 113	.8 U	.16 U	.16 U
M,P-XYLENE	1.4 U	.29 U	.28 U

Appendix C-2 (Continued)
Analytical Laboratory Landfill Gas Sampling Results
Site 1 Tidal Area Landfill
Naval Weapons Station Seal Beach Detachment Concord

Point ID	**0321TLSS022**	**0321TLSS023**	**AMBIENT AIR BLA**
Sample ID	0321LFG008	0321LFG009	0321LFG001
Matrix	SOIL GAS	SOIL GAS	SOIL GAS
Sample Date	02/02/2005	02/02/2005	02/02/2005
Sample Depth (in feet)	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
EPA Method TO15 (in ppbv)			
METHYL TERTIARY BUTYL ETHER	1.7 U	.35 U	.34 U
METHYLENE CHLORIDE	1.8 U	.36 U	.35 U
O-XYLENE	1.4 U	.29 U	.28 U
STYRENE	1.4 U	.29 U	.29 U
TETRACHLOROETHENE	.9 U	.18 U	.18 U
TOLUENE	1.6 U	.33 U	.32 U
TRANS-1,2-DICHLOROETHENE	1.5 U	.32 U	.31 U
TRANS-1,3-DICHLOROPROPENE	1.3 U	.28 U	.27 U
TRICHLOROETHENE	1.1 U	.23 U	.23 U
TRICHLOROFLUOROMETHANE	1.1 U	.22 U	.22 U
VINYL ACETATE	1.7 U	.36 U	.35 U
VINYL CHLORIDE	2.4 U	.49 U	.48 U
EPA Method TO3 (in ppbv)			
C6+ AS N-HEXANE	3.6	1.2 U	1.2 U
ETHANE	.61 U	.62 U	.61 U
METHANE	2.8	2.5	3
N-BUTANE	.61 U	.62 U	.61 U
N-HEXANE	.61 U	.62 U	.61 U
N-PENTANE	.61 U	.62 U	.61 U
N-PROPANE	.61 U	.62 U	.61 U
EPA Method 3C (in %V/V)			
CARBON DIOXIDE	.198	.177	.122 U
NITROGEN	77.4	77.4	77.5
OXYGEN	22.4	22.4	22.5

Appendix C-2 (Continued)
Analytical Laboratory Landfill Gas Sampling Results
Site 1 Tidal Area Landfill
Naval Weapons Station Seal Beach Detachment Concord

Notes:

	Inorganic results less than 10 are reported to two significant figures and results greater than 10 are reported to three significant figures.
	Organic results less than 10 are reported to one significant figure and results greater than 10 are reported to two significant figures.
J	Estimated value
U	Not detected with detection limit indicated
ppbv	Parts per billion volume

APPENDIX D
QUALITY CONTROL SUMMARY REPORT

CONTENTS

TABLES

ABBREVIATIONS AND ACRONYMS

%D	Percent difference
%RSD	Percent relative standard deviation
40 CFR	Title 40 of the Code of Federal Regulations
ASTM	American Society for Testing and Materials
CRDL	Contract-required detection limit
CRQL	Contract-required quantitation limit
EPA	U.S. Environmental Protection Agency
LCS	Laboratory control sample
LFG	Landfill gas
PARCC	Precision, accuracy, representativeness, completeness, and comparability
PQL	Practical quantitation limit
QA/QC	Quality assurance and quality control
QAPP	Quality assurance project plan
QCSR	Quality control summary report
RPD	Relative percent difference
RRF	Relative response factor
RT	Retention time
TIC	Tentatively identified compound
Tetra Tech	Tetra Tech EM Inc.
TO	Toxic organic
VOC	Volatile organic compound

1.0 INTRODUCTION

This appendix consists of the quality control summary report (QCSR) for landfill gas (LFG) screening and sampling by Tetra Tech EM Inc. (Tetra Tech) for the Site 1 Tidal Area Landfill at the Naval Weapons Station Seal Beach Detachment, Concord (NWS SBD Concord). One sampling event took place in February 2005. This QCSR presents methodologies, results, and conclusions of both cursory and full quality assurance and quality control (QA/QC) reviews of LFG data.

This report consists of six sections. Section 2.0 provides an overview of the data validation process. Sections 3.0 and 4.0 present the validated results for cursory and full reviews. Section 5.0 summarizes the precision, accuracy, representativeness, completeness, and comparability (PARCC) evaluation, and Section 6.0 presents conclusions regarding the overall evaluation of the chemical data. The references cited in this QCSR are provided after Section 6.0.

2.0 VALIDATION METHODOLOGY

Data validation is a systematic process for reviewing and qualifying data against a set of criteria to verify whether they are adequate for their intended use. Laboratory analytical data were validated according to the procedures outlined in the following documents:

- U.S. Environmental Protection Agency (EPA) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review" (EPA 1999a)
- "Data Validation Statement of Work" (Tetra Tech 2001)
- "Final Landfill Gas Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan) for Site 1 Tidal Area Landfill at Naval Weapons Station Seal Beach Detachment Concord, Concord, California" (Tetra Tech 2005)

Data were validated in two stages: (1) a cursory review of analytical reports and QA/QC information for 100 percent of the chemical data from the laboratory, and (2) a full review of analytical reports, QA/QC information, and associated raw data for a minimum of 10 percent of the laboratory chemical data. The cursory review evaluated QA/QC information such as holding times, calibration requirements, and spiking accuracy. Additional QA/QC criteria were evaluated during the full review, and the raw data were used to check calculations and analyte identifications. Qualifiers were assigned to the results in the electronic database at both stages of validation in accordance with EPA guidelines, the quality assurance project plan (QAPP) (Tetra Tech 2005), and associated analytical methods.

The overall objective of data validation was to evaluate whether the quality of the laboratory chemical data set was adequate for its intended purpose, as described in the QAPP (Tetra Tech 2005), by evaluating PARCC. The following tasks were completed to assess the PARCC parameters:

- Reviewing precision and accuracy of laboratory QC data
- Reviewing precision, accuracy, and representativeness of field QC data
- Reviewing the overall analytical process, including holding times, calibrations, analytical or matrix performance, and analyte identification and quantitation
- Assigning qualifiers to data affected when QA/QC criteria were not achieved
- Reviewing and summarizing the implications of the frequency and severity of qualifiers in validated data
- Calculating completeness and comparing the value with goals set forth in the QAPP (Tetra Tech 2005)
- Reviewing selection of methods and technical performance for comparability

On February 2, 2005, eight LFG samples were collected in Summa canisters and analyzed as proposed in the final landfill gas sampling and analysis plan (Tetra Tech 2005). In addition, one duplicate sample and one QC blank were submitted to the laboratory for analysis. The analytical program included the off-site laboratory analysis and methods listed in Table D-1. Sample containers, holding times, and preservation requirements are also listed in Table D-1.

3.0 CURSORY REVIEW

Cursory review of analytical reports for the methods listed in Table D-1 included evaluating the following parameters, as applicable: holding times, initial and continuing calibrations, laboratory and field blanks, accuracy, laboratory precision, analytical or matrix performance, and an overall assessment of the data. Components of the cursory review and the results of each specific review are discussed in Sections 3.1 through 3.6 of this appendix. Section 3.7 discusses results that were reported below the contract-required quantitation limit (CRQL), the contract-required detection limit (CRDL), and the practical quantitation limit (PQL). Section 3.8 discusses the tentatively identified compounds (TIC).

3.1 HOLDING TIMES

Technical holding times were defined as the maximum time allowable between sample collection and, as applicable, sample extraction, preparation, and analysis. The Clean Water Act authorized EPA to establish technical requirements for holding times and preservation for water samples that are set forth in Title 40 of the *Code of Federal Regulations* (40 CFR) Part 136. Holding times used for validation for methods that are not covered by 40 CFR Part 136 either were recommended in specific analytical methods or were specified in the QAPP (Tetra Tech 2005).

TABLE D-1: ANALYTICAL AND FIELD SCREENING METHODS

Tidal Area Landfill (Site 1), Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Analysis	Method	Matrix	Holding Time (From Date Sampled)	Container	Preservative
Volatile Organic Compounds	EPA TO-15	Air	30 days for Summa canister 72 hours for Tedlar bag	Summa canister or Tedlar bag	None
Landfill Gases	ASTM D 1946	Air	30 days for Summa canister 72 hours for Tedlar bag	Summa canister or Tedlar bag	None
Landfill Gases	TO-3M	Air	30 days for Summa canister 72 hours for Tedlar bag	Summa canister or Tedlar bag	None
Methane, oxygen, carbon monoxide, carbon dioxide, and nitrogen	Gastech model GT-408 and land surveyor	Air	N/A	N/A	N/A
Hydrogen sulfide	Gastech model GT-402	Air	N/A	N/A	N/A

Notes:

ASTM American Society for Testing and Materials
EPA U.S. Environmental Protection Agency
N/A Not applicable
TO Toxic organic
Source: EPA 1999b.

None of the analytical results was qualified as estimated or rejected because holding times were exceeded. If applicable, samples that were extracted, prepared, or analyzed outside of specified holding times would have been qualified as "Jh," indicating that the results were estimated values (EPA 1999a). If holding times had been grossly exceeded (more than double the specified holding time), nondetected results would have been qualified as "Rh," indicating that the results were rejected.

3.2 CALIBRATION

Requirements for calibration of laboratory instruments were established to help ensure that analytical instruments produce acceptable qualitative and quantitative data for target compounds. Initial calibration demonstrates that the instrument is capable of acceptable performance at the beginning of an analytical run by producing a linear curve. Continuing calibration demonstrates that the instrument is capable of repeating the performance established in the initial calibration (EPA 1999a).

Initial calibration review for organic analysis included evaluating percent relative standard deviation (%RSD), relative response factors (RRF), and retention times (RT). The %RSD indicates the analytical system's linearity over an established concentration range. The RRF indicates the sensitivity of the analytical system to a specific target analyte. RT reflects the analytical system's stability. The review of continuing calibration included an evaluation of percent difference (%D) in lieu of %RSD. The %D measures the analytical system's precision and was calculated by comparing the daily RRF with the RRF established during the initial calibration. No data required qualification as a result of calibration violations.

3.3 LABORATORY AND FIELD BLANKS

Laboratory and field blank samples were analyzed to evaluate the existence and magnitude of contamination that resulted from sample collection or laboratory activities (EPA 1999a). Blanks prepared and analyzed in the laboratory consisted of calibration, method, and preparation blanks. Field QC consisted of canister blanks. If a problem with any blank was found, all associated data were carefully evaluated to assess whether data were affected. Table D-2 summarizes the purpose of each laboratory and field blank:

TABLE D-2: BLANK QUALITY CONTROL SAMPLES
Tidal Area Landfill (Site 1), Naval Weapons Station Seal Beach Detachment Concord, Concord, California

LABORATORY AND FIELD BLANK SAMPLES	
Blank Type	**Purpose of Blank**
Calibration	Evaluate analytical instruments for possible laboratory contamination.
Method and Preparation	Evaluate extraction or preparation procedures for possible laboratory contamination.
Canister	Evaluate sample integrity during transport.

At a minimum, a calibration or a method and preparation blank was analyzed once every analytical period for each instrument. Method and preparation blanks were extracted (or prepared) at a frequency of one per extraction or preparation batch per matrix or per 20 samples, whichever was greater (EPA 1999b).

If laboratory blank contamination had been identified, results within the corresponding sample delivery group would be compared with an action level of 5 times the highest level detected in the associated laboratory blank. Detected results less than the action level for the contaminant in the laboratory blank would be considered nondetected, either at the level of the original result or at the CRQL, whichever was higher (EPA 1999a). The data would be qualified as "UJb," indicating that the results were nondetected and reflected a detection or quantitation limit that may have been raised as a result of low-level contamination in the laboratory blank. No qualifications were necessary as a result of blank contamination.

3.4 ACCURACY

One objective of data validation was to assess the accuracy of the chemical data set. Laboratory accuracy was evaluated using recoveries of surrogate spikes and laboratory control samples (LCS) or blank spikes. Table D-3 summarizes applicable accuracy requirements. Laboratory accuracy for organic analysis using surrogate spikes could be evaluated for individual samples; however, matrix effects frequently present unique problems in evaluating laboratory accuracy for organic analysis (EPA 1999a). In some cases, professional judgment was used in qualifying data; any decisions were clearly identified and documented in the data validation reports.

Data for organic compounds affected by surrogate recoveries outside of QC limits would be qualified as "Ja," indicating that the results were estimated, or in severe cases "Ra," indicating that the results would be rejected (EPA 1999a). Data for organic compounds affected by blank spike problems would be qualified "Je," indicating that the results would be estimated, or "Re," indicating severe matrix problems that resulted in rejected data. No qualification to the data was necessary as a result of surrogate or blank spike violations.

3.5 PRECISION

Laboratory was evaluated by the relative percent differences (RPD) of a duplicate analysis of one sample. Field precision was evaluated by the RPD of the results from a sample and a duplicate sample. RPDs were used to evaluate overall precision and were not used specifically to qualify data. Precision goals for analysis of organic compounds are identified in the QAPP (Tetra Tech 2005).

3.6 ANALYTICAL AND MATRIX PERFORMANCE

In addition to data quality requirements identified and discussed in the previous text, further laboratory QA/QC criteria were evaluated in the cursory review. These additional criteria were concerned primarily with analytical and matrix performance, including internal standard recovery and instrument performance check samples.

Internal standard performance was evaluated for analysis of volatile organic compounds (VOC). Internal standard performance criteria evaluate whether the sensitivity and response of gas chromatography and mass spectrometry are stable during every analytical run. Because matrix effects may affect the performance of internal standards, they may present unique problems in evaluating analytical performance. Internal standard area counts in the sample must be within 50 to 150 percent of the counts found in the associated daily calibration standard. Internal standard retention times must not vary by more than plus or minus 30 seconds from the internal standard in the associated daily calibration standard (EPA 1994, 1999b).

TABLE D-3: PRECISION AND ACCURACY GOALS FOR LANDFILL GAS SAMPLES

Tidal Area Landfill (Site 1), Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Analyte	Air	
	% Recovery	RPD
EPA Method TO-15		
Chloromethane	70-130	25
Vinyl chloride	70-130	25
Chloroethane	70-130	25
1,1-Dichloroethene	70-130	25
1,1-Dichloroethane	70-130	25
cis-1,2-Dichloroethene	70-130	25
1,1,1-Trichloroethane	70-130	25
Benzene	70-130	25
1,2-Dichloroethane	70-130	25
Trichloroethene	70-130	25
Toluene	70-130	25
1,1,2-Trichloroethane	70-130	25
Tetrachloroethene	70-130	25
Ethylbenzene	70-130	25
m,p-Xylene	70-130	25
o-Xylene	70-130	25
1,1,2,2-Tetrachloroethane	70-130	25
1,3-Dichlorobenzene	70-130	25
1,4-Dichlorobenzene	70-130	25
1,2-Dichlorobenzene	70-130	25
trans-1,2-Dichloroethene	60-140	25
Naphthalene	60-140	25
Toluene-d_8	70-130	NA
Bromofluorobenzene	70-130	NA
1,2-Dichloroethane-d_4	70-130	NA
Miscellaneous Gases, ASTM D 1946		
Nitrogen	75-125	25
Oxygen	75-125	25
Carbon dioxide	75-125	25
Carbon monoxide	75-125	25
Methane	75-125	25
Ethane	75-125	25

TABLE D-3: PRECISION AND ACCURACY GOALS FOR LANDFILL GAS SAMPLES (Continued)

Tidal Area Landfill (Site 1), Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Analyte	Air	
	% Recovery	RPD
Miscellaneous Gases, ASTM D 1946 (Continued)		
Propane	75-125	25
n-Butane	75-125	25
Isobutane	75-125	25
n-Pentane	75-125	25
Isopentane	75-125	25
NMOC (C6+)	75-125	25

Notes:

%	Percent
ASTM	American Society for Testing and Materials
EPA	U.S. Environmental Protection Agency
NA	Not applicable; analyte is a system monitoring compound
NMOC (C6+)	Nonmethane organic carbon (C6 and heavier compounds)
RPD	Relative percent difference
TO	Toxic organics

Data for organic compounds affected by violations of internal standard criteria would be qualified as "Ji," indicating that the results were estimated. Data for organic compounds with any internal standard areas less than 10 percent of the internal standard's area in the associated daily standard would be qualified as "Ri," indicating that nondetected results were rejected. Within this data set, however, no data were qualified as estimated, and no data were rejected as a result of analytical or matrix performance violations.

In addition to analytical or matrix performance criteria discussed in the following text, some of the data were qualified with the general qualifiers (Jj or UJj) for other minor analytical or matrix problems encountered. These results were qualified during data validation based on the professional judgment of the reviewer and are well documented in validation reports. These results include some concentrations in samples reported slightly above the highest calibration standard. These results should be considered qualitatively and quantitatively reliable, even though laboratory protocol requires sample dilution for results reported over the calibration range. No data for organic compounds were estimated or rejected based on analytical or matrix performance violations ("Jj" or "Rj" qualified).

3.7 RESULTS BELOW THE CONTRACT-REQUIRED QUANTITATION LIMIT, THE CONTRACT-REQUIRED DETECTION LIMIT, AND THE CONTRACT-REQUIRED REPORTING LIMIT

Analytical instruments can reliably and qualitatively identify organic compounds at concentrations below the CRQL for off-site analysis and below the PQL for on-site analysis. Detected results below the CRQL and PQL are considered quantitatively uncertain. Sample results below the CRQL reported by the laboratory with a "J" qualifier (organic data) were subsequently qualified in data validation as "Jg," indicating that the results were estimated. No data were reported below the CRQL or PQL and, therefore, no data were qualified "Jg."

3.8 TENTATIVELY IDENTIFIED COMPOUNDS

TICs are chromatographic peaks in volatile and semivolatile fraction analyses that were not target analytes, surrogates, or internal standards. TICs must be identified qualitatively by a search of the National Institute of Standards and Technology mass spectral library. The data reviewer assessed the identifications. All TICs were found to be artifacts, common blank contamination, or compounds identified in another fraction.

4.0 FULL REVIEW

A full review was conducted on a random 10 percent of the chemical data. Full review includes the elements of a cursory review, plus the following additional items, as applicable: method compliance, instrument performance check samples, cleanup performance check samples, system performance, target analyte identification, analyte quantitation, detection and quantitation limit verification, and overall assessment of the data.

Criteria for data qualification during the full review are described in EPA guidelines (EPA 1999a), the QAPP (Tetra Tech 2005), and associated analytical methods. Sections 4.1 through 4.4 discuss the components of the full review and the results of each specific assessment.

4.1 ADDITIONAL ANALYTICAL AND MATRIX PERFORMANCE

In addition to the cursory review of data quality requirements discussed in Section 3.0, full review includes additional verification against established QA/QC criteria. Additional requirements for full review are concerned primarily with analytical and matrix performance. For analysis of VOCs, gas chromatography and mass spectrometry instrument performance check samples were analyzed to ensure mass resolution, identification and, to some degree, sensitivity. Specifically, minimum and maximum ion abundance requirements must be met for bromofluorobenzene.

4.2 ANALYTE IDENTIFICATION

Qualitative criteria have been established to minimize erroneous identification of compounds. An erroneous identification can be either a false positive (reporting a compound present when it is not) or a false negative (not reporting a compound that is present). By comparing the sample's mass spectra and retention time with the standard's mass spectra and retention time, analytes were identified for volatile analysis. For positive identification, the compound's mass spectra must contain all of the standard's ions with relative intensities greater than 10 percent, must agree within plus or minus 20 percent of the standard ion's relative intensities, and must not contain any unaccounted ions with relative intensities greater than 10 percent. In addition, the retention time must be within plus or minus 0.06 relative retention time unit of the standard component's retention time (EPA 1994, 1999b). No data for organic compounds were qualified or rejected because analytical and matrix performances were exceeded or as a result of analyte identification violations.

4.3 ANALYTE QUANTITATION

Applicable raw data were reviewed to verify positive results and reported detection or quantitation limits. Approximately 10 percent of the calculations were evaluated and recalculated for reproducibility. Raw data reviewed included, as applicable, the following sources: extraction and preparation logbooks, cleanup logbooks, spike and standard preparation logbooks, instrument printouts, strip chart recordings, chromatograms, and quantitation reports. The following data sources were also evaluated, as applicable: sample dilutions, concentrations, analytical split samples, cleanup, and percent moisture. Review of the raw data showed that the analytical results obtained during 2005 were quantitated properly.

4.4 ANALYTE REPORTING LIMITS

Analyte reporting limits can be affected directly by dilutions. Detection or quantitation limits for water samples were raised by the dilution factor when samples required dilution for analysis; sample dilution is necessary when high concentrations of an analyte were detected or when matrix problems occurred during sample extraction or analysis.

5.0 PRECISION, ACCURACY, REPRESENTATIVENESS, COMPLETENESS, AND COMPARABILITY EVALUATION SUMMARY

The following paragraphs discuss overall data quality, including PARCC parameters, as determined during data validation.

5.1 PRECISION

Precision is a measure of the reproducibility of an experimental value without regard to the true or reference value. Primary indicators of data precision were the RPD of the sample and the duplicate analysis of the sample. The RPDs were within QA/QC criteria. Field sampling precision is evaluated by analyzing field duplicate samples. RPDs for the field sample and sample duplicate were outside QC criteria for several compounds. It is not practical to obtain true field duplicate samples, however, and the data were not qualified based on these outliers.

5.2 ACCURACY

Accuracy assesses the closeness of an experimental value to the true or reference value. Primary accuracy indicators were the recoveries of surrogate spikes and LCS spikes. Spike recoveries were within QA/QC criteria.

5.3 REPRESENTATIVENESS

Representativeness refers to the ability of sample data to reflect true environmental conditions. Factors that affect representativeness include sampling locations, frequency, collection procedures, and possible compromises to sample integrity (such as cross-contamination) that can occur during collection, transport, and analysis. Selection of representative sampling sites is important to ensure that the medium sampled is typical of the site. Correct sample collection, transport, and analytical procedures are important to ensure that samples closely resemble the medium sampled and to minimize contamination.

5.4 COMPLETENESS

Completeness is defined as the percentage of analytical results considered valid. Valid data are identified as acceptable or qualified as estimated (J) during the data validation process. Data qualified as rejected (R) are considered unusable and not valid.

Rejected and unusable data were qualified during the cursory review for the following reasons: exceeded holding time, calibration problems, low surrogate spike recovery, low LCS or matrix spike (MS) recovery, or low internal standard areas. The full review of 10 percent of the data did not yield any additional rejected data.

The assessment of completeness consisted of comparing the amount of acceptable and usable results with the total number of expected results. Completeness of 100 percent was achieved for the data evaluated in this QCSR. The QAPP (Tetra Tech 2005) set a completeness goal of 90 percent for field samples and laboratory samples, which was exceeded.

5.5 COMPARABILITY

Comparability is a qualitative assessment of how well one data set compares with another. Important determinants of comparability include uniformity of sampling activities, analytical procedures, data reporting, and data validation. The use of well-documented American Society for Testing and Materials and other EPA analytical methods, approved laboratories, and the standardized process of data review and validation give the data a high degree of analytical comparability. The use of well-established analytical protocols ensures that the data are comparable with those collected during previous rounds of groundwater sampling.

6.0 CONCLUSIONS FOR DATA QUALITY AND DATA USABILITY

No qualifiers were assigned to the data. Only data qualified as rejected (R) are considered unusable. Based on the overall assessment of the sampling program, QA/QC data, data review, and data validation results summarized in Sections 3.0 and 4.0, all the data obtained under this project are of acceptable PARCC parameters, as described in the QAPP (Tetra Tech 2005). These data, therefore, are usable for risk assessment and site characterization. Supporting documentation and data are available on request, including cursory and full validation reports.

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